AutoDise 6.2.2

User's Manual

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Prepared for Army CECOM Power Generation Branch by

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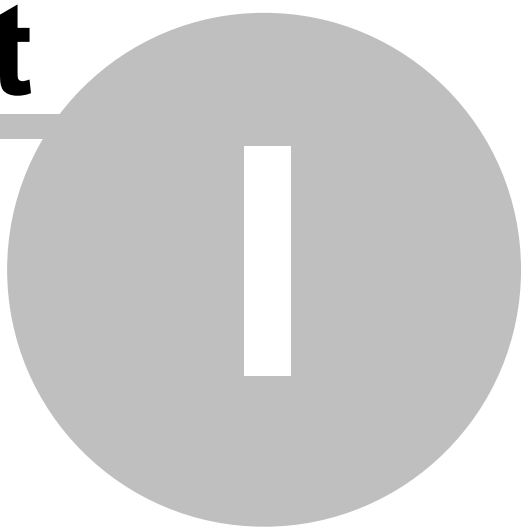

1 Introduction to AutoDISE

AutoDISE is software that utilizes an intuitive graphics interface to aid in the design of layouts for military systems. These systems consist of shelters, electrical consumers, electrical distribution equipment, and power generators. Currently, the main purpose of AutoDISE is to help design power grid layouts. Assisting in correctly sizing, connecting and balancing loads on generators, suggesting cables, calculating voltage drops, estimating fuel consumption, and creating inventory lists of electrical equipment and suggested cabling are some of the main features included in AutoDISE.

Background: AutoDISE was originally conceived as a computer model developed to simulate the use of DISE (Distribution Illumination System, Electrical) or PDISE (Power Distribution Illumination Systems, Electrical). DISE refers to the military family of power distribution equipment (military customized electrical breaker boxes). The program has since been expanded to include multiple services in a much wider range of applications.

The user of AutoDISE should refer to the operator and maintenance manual for DISE and PDISE (TM 9-6150-226-13) as it is the authority over information presented in this user's guide and software.

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1.1 Welcome to Version 6.2.2

Welcome to Version 6.2.2

The following changes have been made since Version 6.2:

1. **Generator Performance Curves:** Users may now input and adjust the performance curves of generators by editing the constants in a polynomial equation. The performance curves are used to estimate fuel consumption. User may also select whether the performance curve equation applies to Diesel 2 or JP-8 fuel types.

2. **Demand Factor:** AutoDISE has expanded the use of shelter demand factors. Item mouseovers, callouts and generator analysis views all now contain information which summarizes consumer load information with the demand factor included. AutoConnect also now contains the option of including demand factors when calculating generator maximum loads. Finally, options are provided in Layout Properties which allow the user to configure warnings such that the calculations for determining overloaded conditions for generators take demand factors into account.

3. **Custom Cables and Restricting Cable List**: Users may now enter user-defined cables into the Toolbox. In addition, users may, on a whole layout basis or on a specific link basis, restrict the types of cables that are used when AutoDISE recommends cables to be utilized for links.

4. **Expanded Use of Frameworks**: The concept of "frameworks", previously restricted to shelters for the purpose of developing staking layouts, has been expanded to non-electrical items and upgraded to allow for specific non-rectangular shapes such as octagons, hexagons and decagons. Items on a layout default to a standard rectangular framework. Addition of features such as shelter accesses continue to be limited to shelters.

5. **Custom Text in Frameworks**: Users may now add text directly to shelters and non-electrical items via the expanded frameworks feature mentioned in item 4 above.

6. **Grouping Icons**: AutoDISE now permits items on a layout to be grouped, similar to the grouping feature found in Microsoft Word and PowerPoint. Grouped items "cling" to each other and may be dragged around as a single unit, while still permitting editing of individual items using the right-click menu options.

7. **Icon Editor**: AutoDISE now provides a basic drawing interface for editing icons directly, rather than relying on external programs such as MS Paint. The features of this tool are still fairly basic, providing the ability to draw lines, arrows, fill shapes, fill gradients, and to upload images, adjust brightness, etc.

8. **Added Tutorials and Sample Layouts** (Version 6.2.2): AutoDISE now provides tutorials to assist users with learning the program, as well as sample layouts which can be used separately, or with the tutorials. Find these new features in the Help menu.

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9. **Upgraded Icon Manager** (Version 6.2.2): The Icon Manager tool has been redesigned and upgraded to make management and selection of icons easier and more intuitive, including grouping of icons in categories and allowing customized icon names.

1.2 Definitions

The following definitions are important to understanding AutoDISE, this document, and the operating instructions that follow. The definitions below will be explained in greater detail in sections that follow.

- The **Layout** can refer to two different things:

    1. The entire collection of data contained in an individual layout (.adf) file. For example, we refer to "Layout Properties" which contain properties for both the main and shelter layouts.

    2. The drawing area consisting of the items and cables that are placed on it. In this case, this manual tries to specifically address the type of layout: the Main Layout or a Shelter Layout

- **Toolbox Equipment** consist of the electrical consumers, shelters, generators, distribution equipment (DISE and breaker panels, receptacles, special purpose equipment) and non-electrical items that exist in the AutoDISE database.

- **Layout Items** consist of each and every electrical consumer, shelter, generator, distribution item and non-electrical item that placed in a particular layout.

- **Connections** are the physical locations where a cable can attach to an item. Connections are distinguished by rating, number of phases, phase, connector type, and input/output.

- **Links** between connections on two items. For example, a generator is connected to a distribution center by a link.

- **Electrical Cables** are the actual electrical cables (e.g.,"25 ft 100 amp 3 "). A Link is "made up" of one or more cables. For example a 119 foot 100 amp 3 Link might consist of a 100 ft 100 amp 3 cable and a 25 ft 100 amp 3 cable.

- **Staking** refers to the process of designing and laying out a system of shelters and passageways that are interconnected to form a modular facility, based on the DEPMEDS (Deployable Medical Systems) concept currently in use by hospital layouts in the United States Department of Defense. See Staking and Staking Terms and Definitions

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1.3 System Requirements

AutoDISE requires a Windows operating system, version Windows 98, Windows ME, Windows 2000 and Windows XP.

AutoDISE has NOT been fully tested in Windows Vista or Windows 7. Issues with running AutoDISE on these systems can be minimized by running the application in ***XP Compatibility Mode***.

AutoDISE has been moderately tested in the Windows Vista environment and has performed well when local network restrictions are minimal. However, in some military computer environments where significant network restrictions exist, users have noticed issues related to network connectivity (lack of ability to download updates automatically and lack of ability to download help manual) as well as inability to browse for and add images to the Icon Manager.

Also required is Microsoft Data Access Components (MDAC) version 2.6 or better. There is no need to figure your MDAC version in advance; AutoDISE will detect it and provide options for upgrading if needed. Windows XP and later operating systems come with a later version of MDAC and require no update.

1.4 Installation

There is no installation required if running AutoDISE off of a CDROM.

If you desire to run AutoDISE off your client machine, simply unzip the program contents from an AutoDISE zip file to a desired folder on the client machine.

The zip file may be downloaded from the AutoDISE Web Site. To download a file from the site, a download key is required. Contact information for obtaining a download key is found on the site.

1.5 Running AutoDISE From a CDROM

AutoDISE may be run directly off of a CDROM with absolutely no installation required.

If running AutoDISE off a CDROM, please note the following:

1. Since CDROMs are Read-Only, layouts may not be saved on the CDROM.

2. For user preferences and custom Toolbox items to persist across multiple uses of AutoDISE on CDROM, AutoDISE must be able to save such information on the C: drive of the CDROM client machine. AutoDISE will attempt to create an AutoDISE folder on the C: drive of the CDROM client machine and will store all database entries in that location. This location is at:

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c:\AutoDISE_TEMP\data

If the user does NOT have sufficient rights to create or edit files on the C: drive of the CDROM client machine, this folder will not be created and user preferences and custom Toolbox items will NOT persist across multiple uses of the AutoDISE CDROM.

AutoDISE will inform the user if such a condition exists.

Important notice about running AutoDISE off CD-ROM and ALSO running AutoDISE off the hard drive:

If a user runs AutoDISE off of a CD-ROM, and then later copies the program to a hard drive and runs it there, *any user-defined items in the Toolbox and any preferences saved while running off of CD-ROM will NOT be visible when running off the hard drive...and vice-versa.* This is because two completely different user data files are being accessed.

When AutoDISE is run off of a CD, the program has no ability to save user defined items on the CD so it creates a temporary data file on the C drive and stores the information there, as mentioned in #2 above. However, when AutoDISE is run off a hard drive, the program does not need to create or use a temporary data file...it simply uses the default data file that comes with the program.

If a user has run AutoDISE off of a CD-ROM and saved user-defined items in the Toolbox while doing so, and wishes to use import these user-defined items into the Toolbox when running off of a hard drive, the user may import the Toolbox items using the Import Toolbox Items From Another Computer feature. Note that the "user.ads" file used for running off CD-ROM, which must be located to run this import, is located at:

c:\AutoDISE_TEMP\data\user.ads

1.6 AutoDISE Web Site

The AutoDISE web site is located at:

https://www.autodise.net

The site contains links to download the AutoDISE program, and is the update server for running AutoDISE updates.

For automatic updates, AutoDISE will automatically communicate with the web site and download updates as necessary.

For manual updates, the user must download the manual update file from the web site and transfer it to the machine to be updated via some removable media such as CD-ROM.

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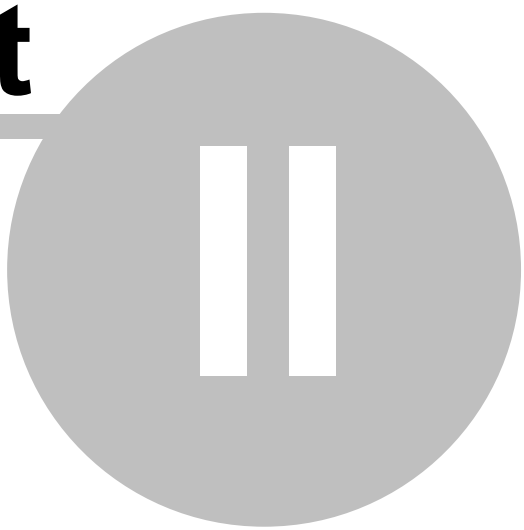
Part



2 Getting started

This section provides instructions for starting AutoDISE, opening a new layout, and understanding the main parts of the program. AutoDISE presumes a basic understanding of Microsoft Windows, such as how to open windows, use select features and open pull-down menus.

If running AutoDISE off a CDROM, simply open the CDROM file directory and double-click on ***AutoDISE.exe***.

If running AutoDISE from a client machine: once files are unzipped to the desired directory on the client machine, navigate to this directory and double-click on AutoDISE.exe to start the program.

2.1 Opening a New Layout

If running AutoDISE for the first time, the program will open with no current layout in view.

For subsequent sessions of AutoDISE, the program will automatically open to the last layout opened or saved by any user. **The option to automatically load the last layout opened or saved by a user can be turned off by opening the Options window from the Tools Menu** . If the last layout is not available (for example, on a network drive that is currently unavailable), the program will open with no layout in view.

To open a new layout, select New from the File Menu or click on the **New Layout** button on the Main Toolbar.

Note: AutoDISE uses a Multiple Document Interface (MDI) format. This means that a user can have multiple layouts open at the same time as separate windows within AutoDISE..

2.2 Parts of the AutoDISE Screen

The figure below shows the AutoDISE screen with a sample layout.

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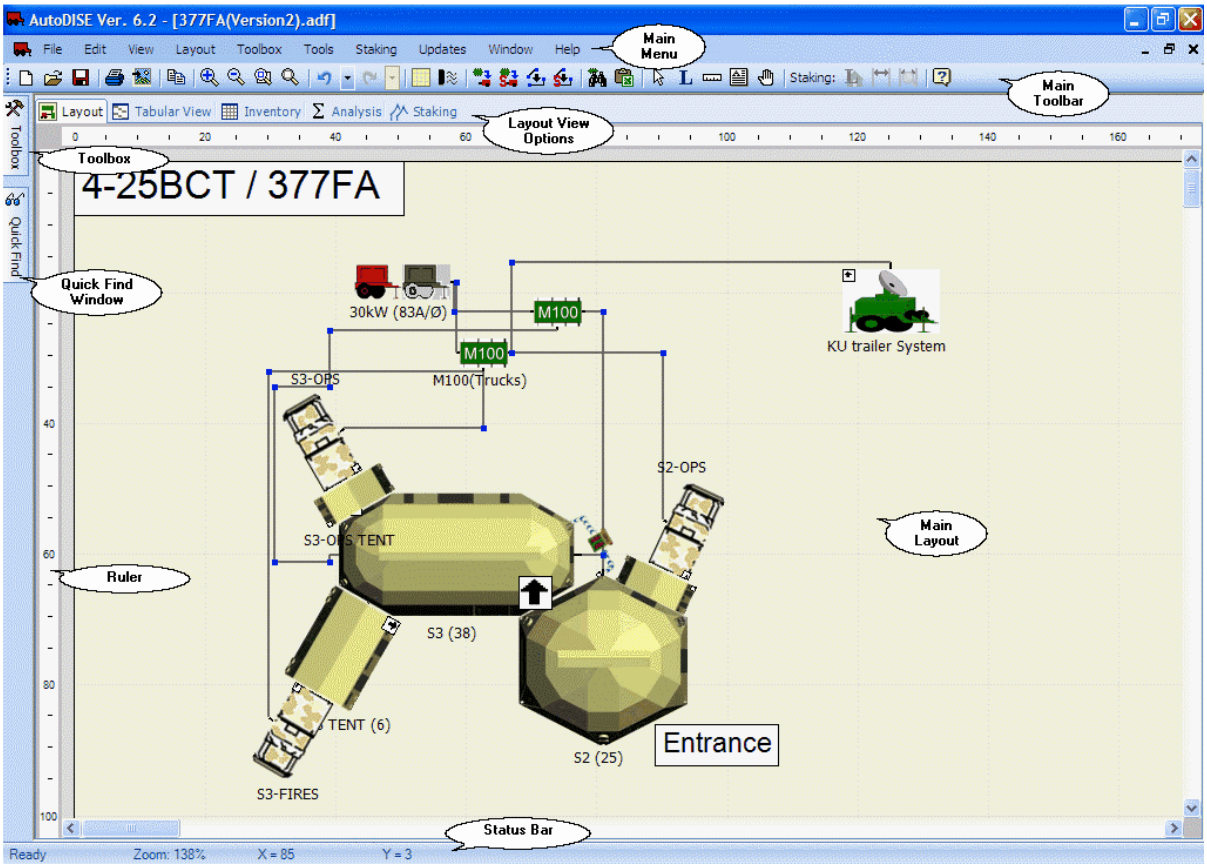

- The **Main Layout** is where the primary layout is built. Items can be dragged and placed where desired.

- The **Status Bar** is located at the bottom of the screen and contains location of the mouse on the layout (in feet) as well as other context-sensitive information.

- The horizontal and vertical **Rulers** and grid lines are available as reference guides and are measured in feet.

- The **Main Menu** contains the majority of functions and views contained in AutoDISE.

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- The **Main Toolbar** contains shortcut buttons for the menu.

- The **Layout View Options** provide five different ways to view data about the current layout.

  1. **Layout**: The default visual display of the layout.
  2. **Tabular View**: A view of the electrical relationships in the layout using a tabular, hierarchal view.
  3. **Inventory**: A tool for producing one or more inventory listings which can be filtered and sorted as needed.
  4. **Analysis**: A collection of electrical data and statistical calculations representing the current state of the layout. This includes total power of the entire layout, summaries of power requirements for non-connected loads, and summaries of loads on each generator on the layout.
  5. **Staking**: A view for the purposes of designing a DEPMEDS staking layout.

- The **Toolbox** is a dockable popout window containing all items in the AutoDISE database that may be added to a layout.

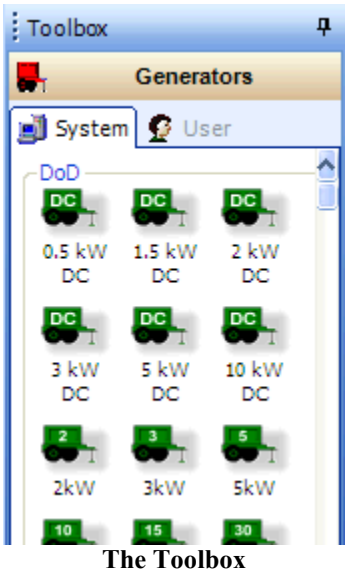
- The **Quick Find Window** contains a tree structure, organizing all items on a layout and permitting quick selection to desired items.

2.3 Adding Items to the Layout

Adding items to a layout

Users can select a particular piece of equipment from the Toolbox and add it to the layout.

Open the Toolbox by clicking on the Toolbox on the left side of the screen. Click on the desired item then move your mouse to the desired layout.



The Toolbox

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Once the user has selected a piece of equipment to add to the layout, the cursor will change to an image representing the generic type of that equipment. The user can then add as many pieces of that equipment type to the layout as desired by clicking the cursor on the desired location within the layout. Once the user is finished adding that item to the layout, right-click to return to normal mode or click on the **Normal Mode** button on the Main Toolbar.

2.4 Selecting and Moving Items on the Layout

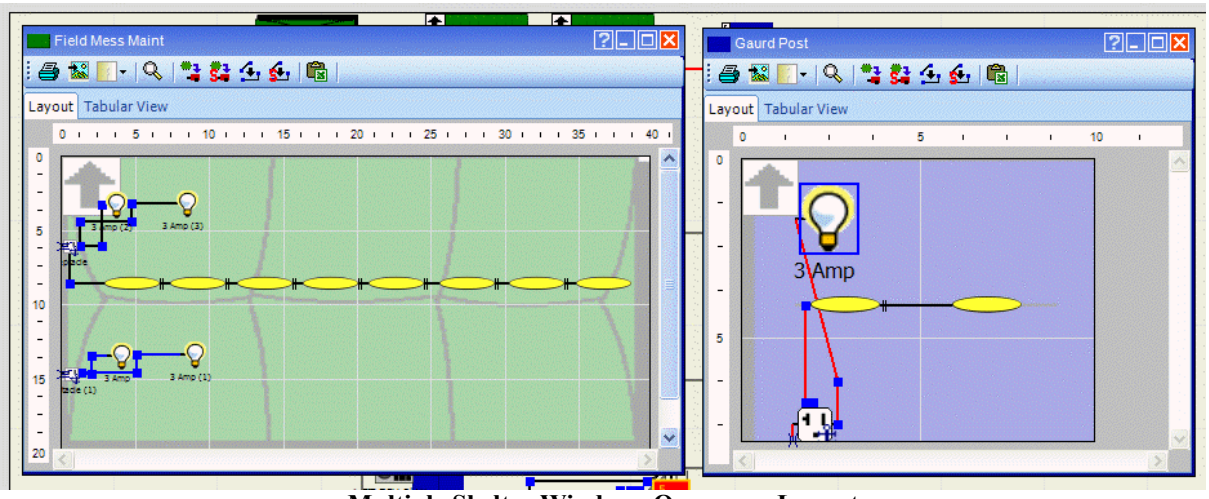
Selecting items on a layout

Selecting items on the main layout or on a shelter layout is similar to selecting folder icons in Windows Explorer.

Click once on an item to select it. Holding down the **CONTROL (Ctrl)** key while selecting items will prevent other selected items from being de-selected, similar to Windows Explorer icon selection functionality.

Moving items on a layout

To move an item on a layout, simply left-click on the item and drag it to its desired location. If shelter windows are open on the screen, such as in the figure below, items may be dragged between shelter layouts or between a shelter layout and the main layout.



Multiple Shelter Windows Open on a Layout

2.5 Connecting Items on the Layout

Links between items on a layout may be created using one of three methods:

1. **Manual Connect** - user activates Link Mode, selects items to connect, then selects connections to connect using the Select Link Connections window.

2. **AutoConnect** – AutoDISE automatically connects all selected items and determines

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most efficient and balanced solution.

3. **Tabular View** - Tabular View contains a tree structure representing the items on a layout. The "nodes" of this tree may be dragged around, thereby modifying the link structure of the layout. For more detail, see Dragging and Dropping Nodes for the Tabular View.

2.6 Steps for Creating a Layout

There are several basic steps to use as a guideline when creating an AutoDISE layout. Following these steps will optimize the performance of AutoDISE.

1. **Gather The Data**

   The task of gathering data is no different than if AutoDISE did not exist. A prepared user will know the following:

   - What shelters are required in the Layout
   - What non-sheltered consumers are required for the Layout
   - What distribution equipment is part of the layout's equipment.
   - What generators are part of the layout's allotted equipment.
   - The consumers that exist in each shelter.

2. **Add Items to the Toolbox**

   The next step is to create the user-defined items that will be needed in the layout that do not already exist in the Toolbox. This includes shelters, generators, consumers, distribution equipment and non-electrical items. For example, for the medical DEPMEDS layout, this step would involve creating a shelter item in the Toolbox for an Operating Room, the Intensive Care Ward, and any other modules that must be placed on the layout, and populating these shelters with internal items and links. This way, the user would only have to create the Operating Room once even if there are, for example, four in that particular layout.

3. **Place Non-Generators Items**

   Place all non-generator items on the layout and in shelter layouts and arrange them as desired. Remember that proximity is a primary factor in the AutoConnect algorithm, so careful location of items will reduce work down the road.

   If multiple consumers are to be added and the data currently resides in a Microsoft Excel spreadsheet, use the Add Multiple Consumers By Tabular Format window to copy and paste the information directly into AutoDISE.

4. **Rename items**

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Rename all items to the desired name by right-clicking on each item and selecting **Rename** from the popup menu that appears. The items may also be renamed by going into the Layout Item Properties window (double-click on an item to open or right-click and select **Properties**) and changing the name there. This window allows the user to select other items on the layout without leaving the window.

When renaming, try to use short names, so the name will no create visual interference, but be descriptive enough to identify items as necessary on the screen. Names can be changed later if desired.

5. **Use Analysis/Total Loads to Determine Power Requirements**

Determine how many generators of what size are needed to power the equipment on the layout. Use the Analysis View to determine how much electrical power is required. Analysis also tells how much power is produced by the generators already have on the layout.

6. **Place Generators and Distribution Equipment**

Select enough generators to provide the required amount of power and place where they are needed. Select distribution equipment to accommodate all loads. Place the distribution equipment as desired.

Use the Analysis View to verify that you have the right amount of power.

Save the layout by **Save** from the File Menu or the clicking the **Save** button on the Main Toolbar.

7. **Use AutoConnect to make Connections**

Run AutoConnect by selecting **AutoConnect** from the Tools Menu or clicking the **AutoConnect** button on the Main Toolbar. The AutoConnect Main Layout window appears. Select desired options and click the **Start AutoConnect** button to run the algorithm.

Note: *The user should connect equipment in shelters prior to connecting shelter equipment to items outside of shelters. This can be accomplished either by selecting the shelter AutoConnect option in the AutoConnect Main Layout window, or by individually running AutoConnect from within each shelter, then running AutoConnect on the main layout last. See AutoConnect for more information.*

8. **Find Unconnected Loads**

The user can find unconnected loads by simply looking at the links on screen and ensuring that all items are connected. However, the quickest way to find unconnected items is to select **Highlight Unconnected Items** from the Tools Menu. This routine highlights each

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unconnected item.

Loads might be connected to distribution equipment but the distribution item may not be connected to a generator. Upon finding an unconnected distribution item, connect it to a generator using manual connect in Link Mode. You may want to use Analysis to find a generator that is currently under-loaded.

9. **Use Analysis to Validate the Layout**

Go to the Analysis View to validate the layout to ensure all loads are connected, to ensure that all generators are not overloaded or under-loaded, the generators are balanced and voltage drops between generators and consumers are not excessive. Quickly check using Ruler Mode whether consumers are within proper distance of the generators. Alternate between adjusting links and re-running Analysis until the layout is as desired. Adjusting links consists of deleting, adding, disconnecting, and connecting.

10. **Align Links**

Select AutoRoute from the Tools Menu or click on the **AutoRoute** button on the Main Toolbar. This will automatically align links at 90 degree angles.

11. **Save the Layout**.

Save the layout by **Save** from the File Menu or the clicking the **Save** button on the Main Toolbar.

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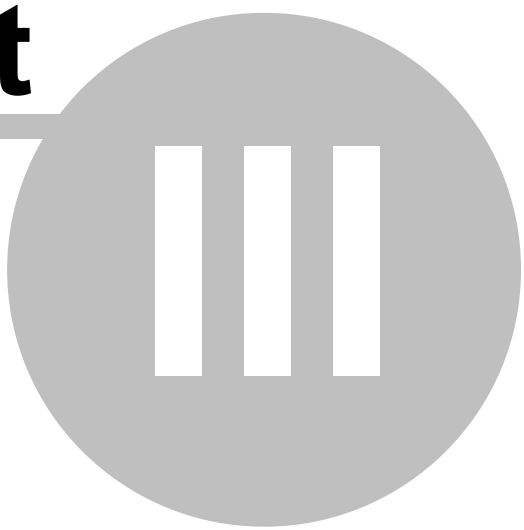
Part



3 Toolbox

The Toolbox is a collection of system-defined and user-defined equipment and cables.

Toolbox Equipment

Toolbox Equipment may be viewed by selecting **View Toolbox Items** from the Toolbox Menu.

AutoDISE provides a pin-able popout window containing all items in the Toolbox that may be added to a layout. The Toolbox is only accessible when an AutoDISE layout is open and Main Layout View or Staking View is open.

Note: When the Staking View is visible, the Toolbox becomes the Staking Toolbox, which only contains shelters, separated by those with Icon Frameworks, and those without.

To open the Toolbox, click on the Toolbox icon on the left of the screen. To add equipment to a layout, see Adding Toolbox Equipment to a Layout.

The Toolbox Icon

The Toolbox contains system-defined and user-defined equipment types that can be added to an AutoDISE layout. There are eight general categories of equipment in AutoDISE for which users can create, edit and/or delete equipment from the Toolbox:

1. Generators
2. Shelters and Tents
3. Distribution equipment
4. AC Consumers
5. DC Consumers
6. Special Purpose Items
7. Non-electrical Items
8. Recent Items (contains most recent items accessed from the Toolbox)

Each category has two tabs: **System** and User**.**

The **System** tab has well-established equipment known to the community. Items in the **System** tab may not be edited or removed by the user.

The **User** tab contains all items added by users. See user-defined equipment for more detail.

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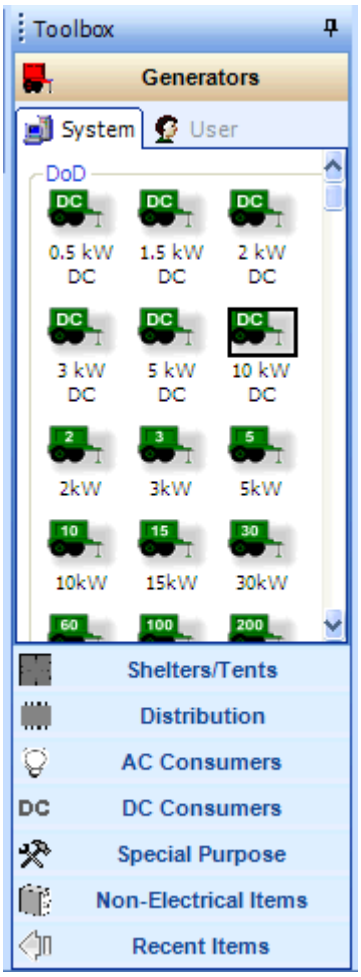

The Toolbox

Toolbox Cables

The Toolbox also contains a collection of system-defined and user-defined electrical cables. Toolbox cables may be view by selecting **View Toolbox Cables** from the Toolbox Menu.

AutoDISE uses this cable collection for making cable suggestions for individual links. See Electrical Cables.

3.1 Toolbox Equipment Types

The Toolbox contains all the different equipment types that may be added to a layout.

Note: When the Staking View is visible, the Toolbox becomes the Staking Toolbox, which only contains shelters, separated by those with Icon Frameworks, and those without.

1. Generators
2. Shelters / Tents
3. Distribution Equipment
4. AC Consumers

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5. DC Consumers
6. Special Purpose Items
7. Non-electrical Items

After each item is placed on a layout, the item may be right-clicked to reveal a list of options for acting on that item. All equipment types have a set of right-click options that are common to them. These are listed in Common Right-click Options.. Right-click options that are unique to a particular type are shown in the section for that type.

To add equipment to a layout, see Adding Toolbox Equipment to a Layout.

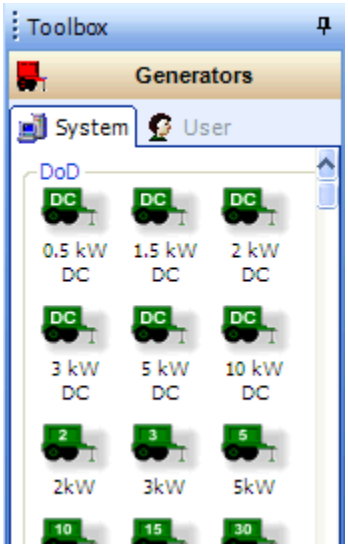
3.1.1 Adding Toolbox Equipment to a Layout

Users can select a particular piece of equipment from the Toolbox and add it to the layout. There are three ways to accomplish this.

Graphical methods

1. Click on the **Add Item to Layout** button located on the Main Toolbar, or select **Add Item to Layout** from the Layout Menu. See the Add Items From Toolbox window for further instructions

2. Open the Toolbox by clicking on the Toolbox on the left side of the screen. Click on the desired item then move your mouse to the desired layout.



The Toolbox

Once the user has selected a piece of equipment to add to the layout, the cursor will change to an image representing the generic type of that equipment. The user can then add as many pieces of that equipment type to the layout as desired by clicking the cursor on the desired location within the layout. Once the user is finished adding that item to the layout, right-click to return to normal mode or click on the **Normal Mode** button on the Main Toolbar.

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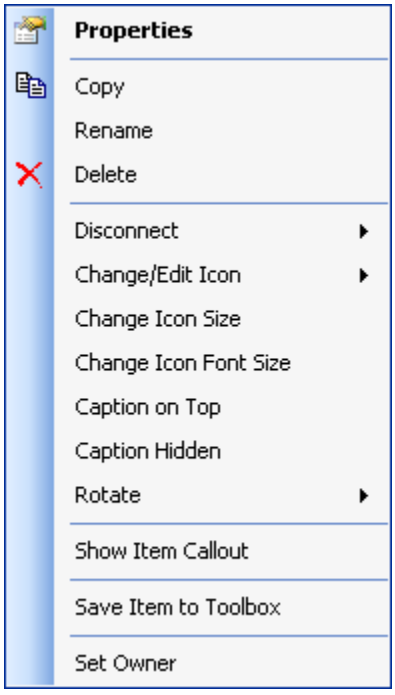
Non-graphical method for Consumers

3. Oftentimes, layout designers have layout consumer data in a Microsoft Excel spreadsheet. AutoDISE provides a method for adding multiple consumers to a layout by copying data from the spreadsheet into the system clipboard, by adding directly from the Toolbox or by manually entering data into a table.

To do this, click on the **Add Multiple Consumers by Tabular Format** button located on the Main Toolbar, or select **Add Multiple Consumers by Tabular Format** from the Layout Menu. See the Add Multiple Consumers by Tabular Format window for further instructions

3.1.2 Common Right-click Options

If a user right-clicks on an item on a layout, an options menu appears next to the item as shown in the figure below. There are many options that are generic to all items.



Common Right-click Options

- **Properties** – opens up the Layout Item Properties window for an item.
- **Copy** – copies the item to the AutoDISE clipboard. After copying an item, right-click on the layout and choose **Paste** to paste a copy of the item on the layout. For shelters, this also copies all items and links within the shelter, ***except for links between paralleled generators and distribution items and the communication links between paralleled generators.***

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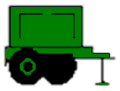
- **Rename** – allows user to rename an item.
- **Delete** – deletes the item permanently from the layout.
- **Disconnect** - Allows you to disconnect inputs or outputs or both from the unit.
- **Change/Edit Icon** – allows user to change or edit the item icon. Selecting the **Edit Icon** option opens the Icon Image Editor window.
- **Change Icon Size** – This appears for every item type EXCEPT for shelter and non-electrical items and allows for icon resizing as a shortcut to opening and resizing the Icon Framework. Shelters and non-electrical items are unique in that they are drawn to scale based on their specified length and width.
- **Change Icon Font Size** – allows user to adjust caption font size.
- **Caption on Top** – check to put caption at top of icon rather than the default location at the bottom.
- **Caption Hidden** – check to hide or unhide caption.
- **Rotate -** allows user to rotate an icon by set amounts or a custom amount. See Rotating Icons.
- **Show Item Callout** - Activates an item callout for the respective item. See Callouts.
- **Save Item to Toolbox -** Adds the item to the user-defined portion of the Toolbox so it can be added to this or future layouts. For shelters, this also saves all internal items, as well as all links between those internal items, ***except for links between paralleled generators and distribution items and the communication links between paralleled generators.***
- **Set Owner** - Text that is set to show ownership. Can be viewed in Inventory View

3.1.3 Generators



Generators

Operating Modes

Generators are defined by rated power, rated voltage and modes within which they can operate. AutoDISE currently allows a generator to operate in four distinct operating modes:

1. Single phase, 2-wire mode
2. Single phase, 3-wire mode (e.g., 120/240V for a 120V generator)
3. Three phase, 4-wire mode (e.g., 120/208V for a 120V generator)
4. DC mode (variable DC voltage)

Larger generators operate only in three phase, 4-wire mode. This is therefore the default mode of AutoDISE. Generators operating in this mode can power 3-phase AC consumers, two phase consumers (see note below) and single-phase AC consumers. It is important that generators are well balanced and operate the majority of their time in their design regime.

Note: Two phase consumers connected directly to two of the three phases of a generator operating in three phase, 4-wire mode will only operate at 75% of their rated capacity since they will experience the phase-to-phase voltage rather than twice the phase-to-neutral

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voltage (e.g., 208V rather than 240V for a 120/208 VAC generator). This can be remedied using a "two phase" transformer. See Transformers for more information.

Some generators have five wires, adding a ground to the three phase wires and one neutral wire of a typical 4-wire generator. When using AutoDISE, such generators should be treated as if they are 4-wire generators.

All generators allow for a variable voltage, which may be changed in the Layout Item Properties window. This voltage may only be changed when a generator is completed disconnected. To attach any item to a generator, the rated voltages must match.

Power Plant Mode

AutoDISE also defines Power Plant Mode which effectively doubles the rated power of a generator by simulating placement of a second, identical generator alongside the original. See Power Plant Mode for more information.

Generator Rated Power

A generator's prime rated power is usually defined in kilowatts and is the maximum power that the generator is designed to produce. Loads and power may also be expressed in Amps and Amps per phase respectively where Amps = Power (watts) / generator voltage and Amps per phase = Power (watts)/generator voltage/ # of phases.

See Generator Properties.

3.1.3.1 Generator Right-click Options

If you right-click on a generator on the layout, an options menu appears next to the generator. Right-click options that appear for all items are discussed in Common Right-click Options.

The following options are unique to generators:

1. **Modes** – all modes allowed for the generator will be shown, with the current mode in effect annotated with a check mark.

2. **Power Plant Mode** - Allows the user to toggle between Power Plant Mode and normal mode.

3. **Power Plant Dual Mode/Power Plant Single Mode** - Allows the user to toggle between Power Plant Dual and Power Plant Single modes See Power Plant Mode for more details

4. **Deactivate** - this option appears for paralleled generators and permits the user to deactivate all but one of the paralleled generators so as to shift the load to the active generator(s).

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3.1.3.2 Generator Modes

3.1.3.2.1 Operating Modes

Generators are defined by rated power and modes within which they can operate. AutoDISE currently allows a generator to operate in four distinct operating modes:

1. Single phase, 2-wire mode
2. Single Phase, 3-wire mode (e.g., 120/240V for a 120V generator)
3. Three phase, 4-wire mode (e.g., 120/208V for a 120V generator)
4. DC mode (variable DC voltage)

Larger generators operate only in three phase, 4-wire mode. This is therefore the default mode of AutoDISE. Generators operating in this mode can power 3-phase AC consumers, two phase consumers (see note below) and single-phase AC consumers.

Note: Two phase consumers connected directly to two of the three phases of a generator operating in three phase, 4-wire mode will only operate at 75% of their rated capacity since they will experience the phase-to-phase voltage rather than twice the phase-to-neutral voltage (e.g., 208V rather than 240V for a 120/208 VAC generator). This can be remedied using a "two phase" transformer. See Transformers for more information.

Some generators have five wires, adding a ground to the three phase wires and one neutral wire of a typical 4-wire generator. When using AutoDISE, such generators should be treated as if they are 4-wire generators.

All generators allow for a variable voltage, which may be changed in the Layout Item Properties window. This voltage may only be changed when a generator is completed disconnected. To attach any item to a generator, the rated voltages must match.

3.1.3.2.2 Paralleling Generators

Non-DC Generators in AutoDISE may be paralleled. AutoDISE provides two distinct methods for paralleling generators:

1. **Standard Paralleling** - Standard Paralleling allows a user to parallel up to three generators of equal rating, voltage and mode and attach them to a distribution item with multiple inputs. In this method, the user must manually make all connections, including the decision of which generators are to connect to which distribution item input connections

2. **Power Plant Mode** - Oftentimes, generators come in pairs on a trailer or sled. These "Power Plants" have a preconfigured switchbox for paralleling the two generators. From a user perspective, the Power Plant has one output cable and can therefore be treated as a single item in "**Power Plant Mode**". Therefore, generators in **Power Plant Mode** may connect to a distribution item which has only a single input connection.

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Generators in **Power Plant Mode** may be set to **Single Mode** or **Dual Mode**, meaning one or both generators are online, respectively.

There are several reasons why it is desirable to have generators combined in power plants:

a) Two generators would operate together to share higher loads, while at off peak loads either generator would handle the entire load. In order to achieve efficient power generation, manufacturers recommend that generators run between 50%-100% their prime rating, also known as the design regime. In the design regime generators are assumed to run peak fuel efficiency and low depreciation. The further away from the design regime a generator-set operates, the less efficient it is, and more wear and tear results. Wear is especially likely off load with diesel engines because "wet-stacking" can occur. Wet-stacking describes the condition when excess oil collects in the exhaust and occurs when diesel engines operate at loads well below design for long periods of time. This often results in engine damage.

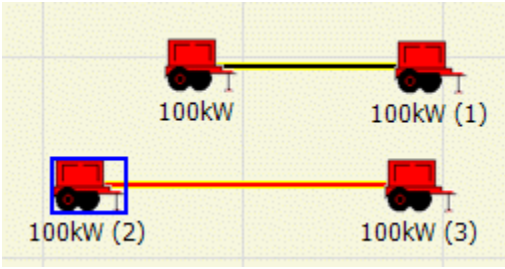
b) Two smaller generators are sometimes easier to transport than one bigger generator.

c) Power Plants provide a redundant source of back up power required by some critical electrical networks.

3.1.3.2.2.1 Standard Paralleling

Standard Paralleling allows a user to parallel up to three generators of equal rating, voltage and mode and attach them to a single distribution item with multiple inputs. The user may either first parallel the generators then attach them to the distribution item or connect the individual generators one at a time to the distribution item and let AutoDISE parallel the generators.

To parallel two generators, simply manually connect them using Link Mode. If the generators are of the same rating and mode, then a parallel link will appear between the generators. This link represents the communication cable between the generators used during the parallel process. If this link exceeds the maximum communication cable length of 25 feet, the cable turns red. See the Figure below.



The user can then link either generator to a distribution item with sufficient input connections to handle all the paralleled generators. For each generator, AutoDISE will prompt the user for which input connection to use for each generator. A completed parallel generator to

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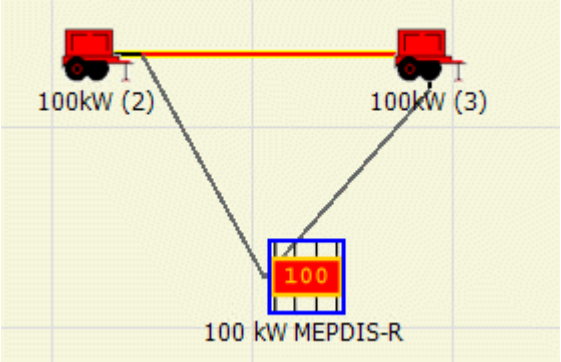
distribution item setup is shown below.

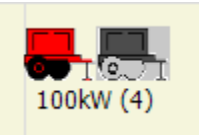


Loads are split evenly among all active paralleled generators. Users have the option of deactivating a generator, thereby forcing the loads to be carried by the remaining generators. This may be done by right-clicking on a paralleled generators and selecting **Deactivate**.

3.1.3.2.2.2 Power Plant Mode

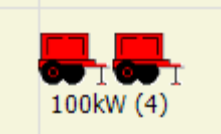
Oftentimes, generators come in pairs on a trailer or sled. These "Power Plants"have a preconfigured switchbox for paralleling the two generators. From a user perspective, the Power Plant has one output cable and can therefore be treated as a single item in "**Power Plant Mode**". Therefore, generators in **Power Plant Mode** may connect to a distribution item which has only a single input connection.

Any generator can be switched from normal, single plant mode to **Power Plant Mode** simply by right-clicking on the generator and selecting **Power Plant Mode**. By default, Power Plants are in **Single Mode**, meaning that only one of the generators is online. This is the normal configuration since the second generator is typically used for backup or while the primary generator is undergoing maintenance. See the Figure below.



Generator in Power Plant, Single Mode

The user may place the **Power Plant** in **Dual Mode** by right-clicking and selecting **Dual Mode**. This is the mode where both generators are online and are being paralleled. The power output for this mode is twice that of **Single Mode**.



Generator in Power Plant, Dual Mode

There are several reasons why it is desirable to have generators combined in power plants:

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a) Two generators would operate together to share higher loads, while at off peak loads either generator would handle the entire load. In order to achieve efficient power generation, manufacturers recommend that generators run between 50%-100% their prime rating, also known as the design regime. In the design regime generators are assumed to run peak fuel efficiency and low depreciation. The further away from the design regime a generator-set operates, the less efficient it is, and more wear and tear results. Wear is especially likely off load with diesel engines because "wet-stacking" can occur. Wet-stacking describes the condition when excess oil collects in the exhaust and occurs when diesel engines operate at loads well below design for long periods of time. This often results in engine damage.

b) Two smaller generators are sometimes easier to transport than one bigger generator.

c) Power Plants provide a redundant source of back up power required by some critical electrical networks.

3.1.3.3 Performance Curve

The performance curves for individual generators are set in the **Performance Curve** tab of the Toolbox Item Properties for a generator window, the Toolbox - Add New Generator window, or Layout Item Properties for a generator window:

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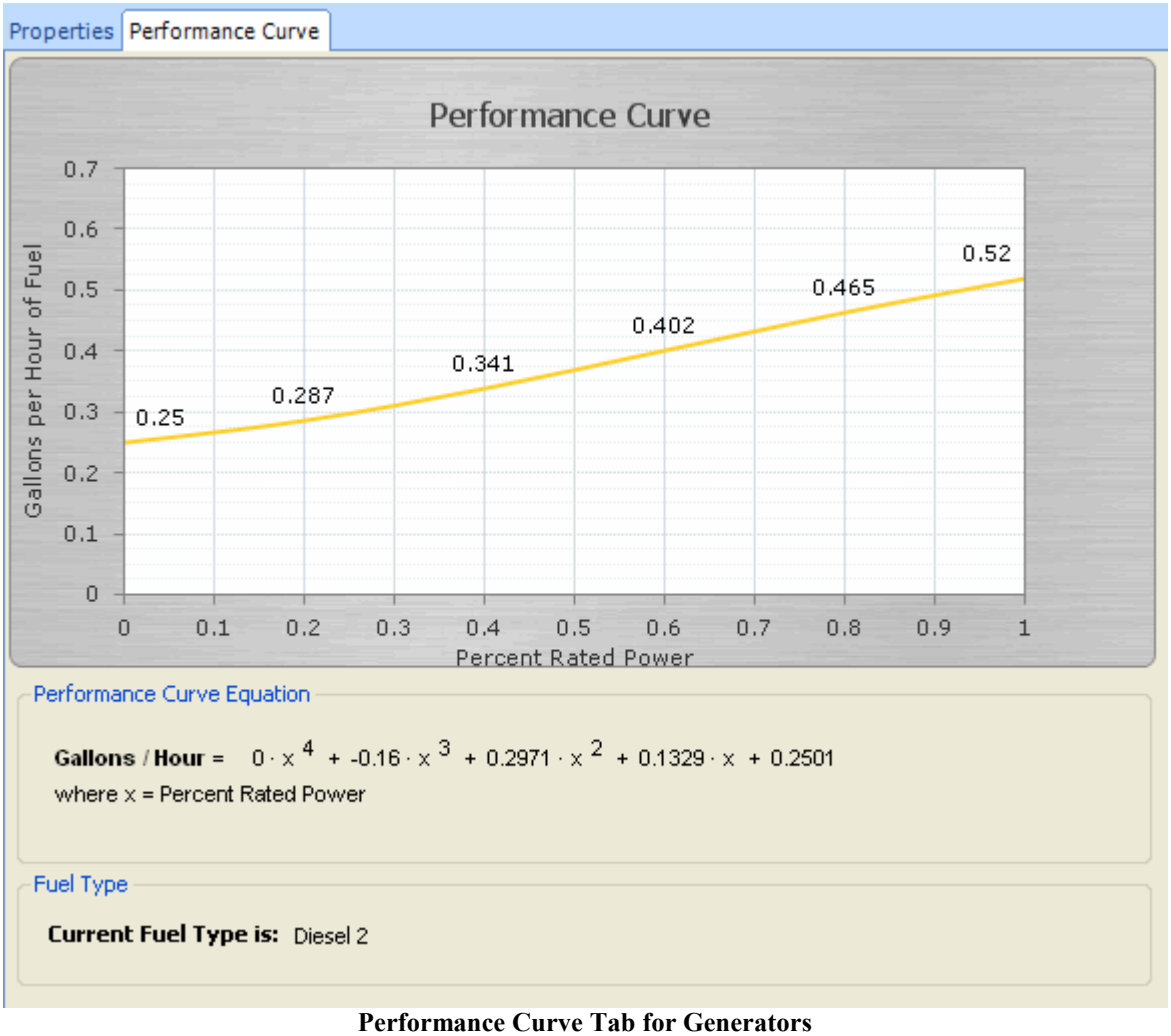

Performance Curve Tab for Generators

The performance curve is defined by the 4th order polynomial below.

$$y = c1*x4 + c2*x3 + c3*x2 + c4*x + c5$$

where y is the fuel consumption rate in gallons / Hr, x is the percent load, and c1-c5 are editable constants that determine the shape of the curve.

Because performance curves of diesel generators vary, the user is able to set or adjust the variable constants of each generators polynomial to model the desired generator performance. This curve fitting process can be determined mathematically from experimental data of the generator using a curve fitting process like EXCEL uses.

The performance curves for the 3 kW, 5 kW, 10kW, 15kW, 30kW, 60kW, 100kW and 200kW have been preset in the system toolbox using empirical data that was provided by Aberdeen Proving Ground with TQGs operating on Diesel-2 fuel. See the following Chart with the corresponding polynomial fits below. These polynomials represent a perfect fit (R-squared=1) of the experimental data points provided. For all other generators, linear

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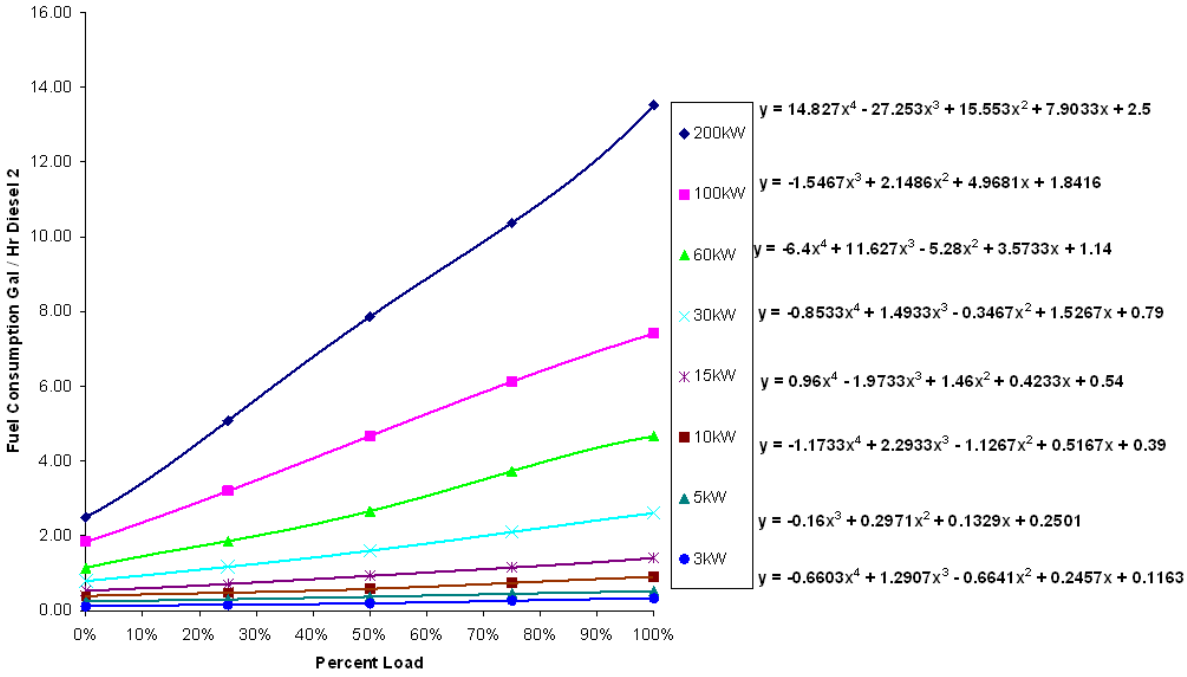
polynomials are created by extrapolating the efficiency data based on the generator size.



In AutoDISE the user can select from the following two types of fuel available during curve fitting. The user must specify which fuel type was used during the curve fit and which type of fuel is available for use in the field. The two types of fuel are JP-8 and Diesel 2. Below lists their respective Net Heat of Combustion or energy available by combusting a gallon of fuel.

LHV (Net Heat of Combustion)

* **Diesel 2** = 131,207 BTU/gal
* **JP-8** = 123,069 BTU/gal

* (Fuel User Guide published by TARDEC in 2000)

Diesel 2 produces 106.6% (131,207 / 123,069) more energy than JP-8 per gallon and thus the respective polynomial curve fitting constants of JP-8 are 106.6% times the value of the curve fitting constants of Diesel 2.

See the Hourly Fuel Consumption Appendix for more information.

3.1.3.4 Phase Balancing

It is important for three-phase generators to be well balanced because unbalanced loads cause high voltage on lightly loaded phase(s) and low voltage on the higher loaded phase(s).

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Damage can occur to generators that are significantly unbalanced for an extended period of time. Balancing loads on a three-phase generator is one of the biggest challenges in the design of DISE layouts. AutoDISE makes this task simpler by using balancing routines within AutoConnect and separate load balancing routines.

Unbalanced generators will show a warning above the generator icon if the unbalanced percentage is greater that the percentage threshold defined in the Warnings Properties tab of the Layout Properties window.

See Phase Balancing

3.1.3.5 Power Factor

This page contains two sections:

- Definition of power factor
- How AutoDISE handles power factor

Definition of power factor

The **power factor** of an AC electric power system is defined as the ratio of the **real power** to the **apparent power**, and is a number between 0 to 1 inclusive.

Real power is the capacity of the circuit for performing work in a particular time. **Apparent power** is the product of the current and voltage of the circuit. Due to energy stored in the load and returned to the source, or due to a non-linear load that distorts the wave shape of the current drawn from the source, the apparent power will be equal to or greater than the real power. Low power factor loads increase losses in a power distribution system and results in increased cost for electrical energy use.

In a purely resistive AC circuit, voltage and current waveforms are in step, changing polarity at the same instant in each cycle. Where reactive loads are present, such as with capacitors or inductors, energy storage in the loads result in a time difference between the current and voltage waveforms. This stored energy returns to the source and is not available to do work at the load. A circuit with a low power factor will have thus higher currents to transfer at a given quantity of power than a circuit with a high power factor.

Circuits containing only heating elements (filament lamps, strip heaters, cooking stoves, etc.) have a power factor of 1.0. Circuits containing inductive or capacitive elements (lamp ballasts, motors, etc.) often have a power factor below 1.0.

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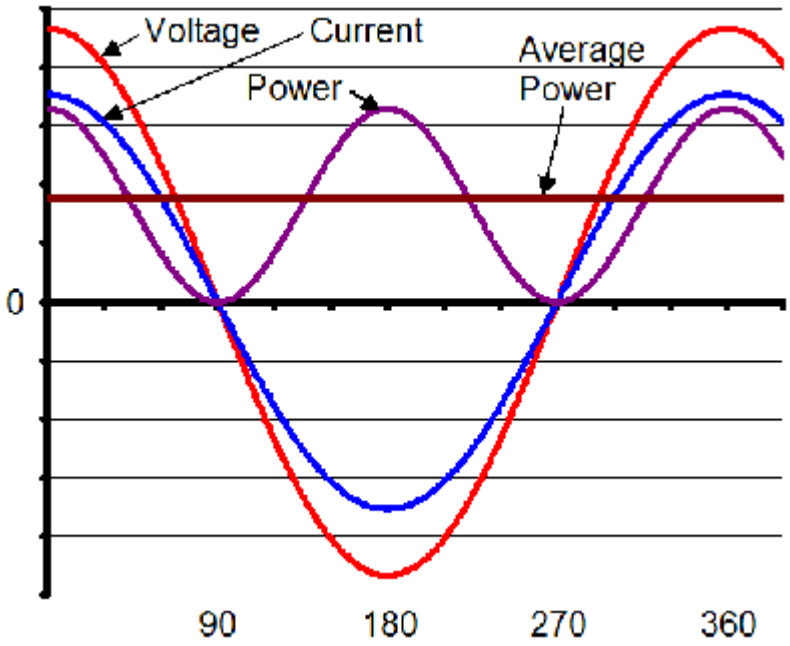
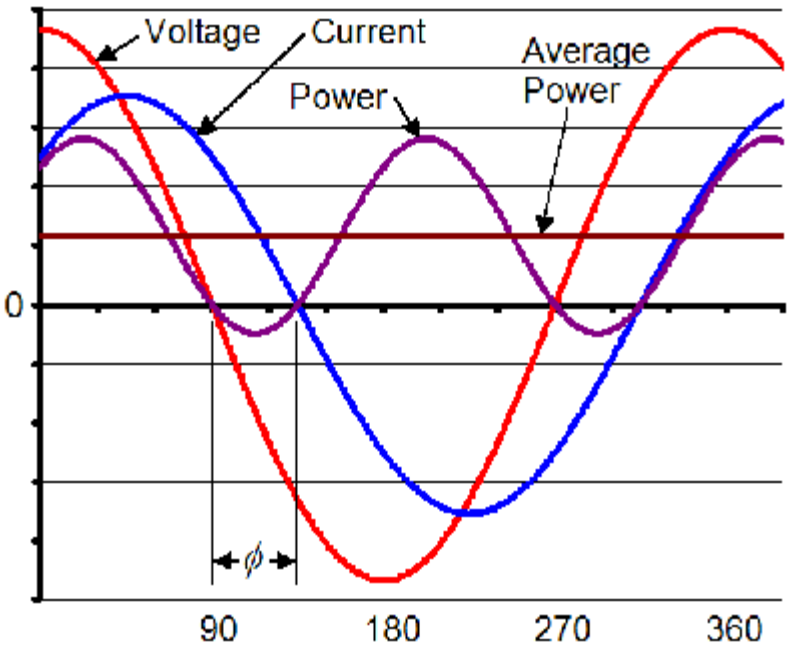


Instantaneous and average power calculated from AC voltage and current with a power factor = 1



Instantaneous and average power calculated from AC voltage and current with a power factor < 1

How AutoDISE handles power factor

AutoDISE allows for power factors of either 0.8 or 1.0, depending on the user's preference and how they prefer to perform generator analyses.

To set this option, open the Options window, by selecting **Options** from the Tools Menu.

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Open the **Other** tab of this window and either check or uncheck the option labeled "**Assume all generators are operating at a power factor of 0.8, and display generator rated power in kVA".**

Checking this option means that a power factor of 0.8 will be assumed for all generators, while unchecking this option means that a power factor of 1.0 will be assumed. If the option is checked, all generator rated power in AutoDISE will be displayed in kVA rather than kW.

Note: For consumers, it is assumed that the user will enter consumer ratings based on the power factor selected in the Options window.

3.1.3.6 Wet-stacking

Diesel engines are designed to operate with a load. When a diesel engine operates considerably below the rated output level the engine can start to over-fuel or "**wet-stack**". Diesel engines perform most efficiently in the 70-80% range of rated output. When an engine operates for a prolonged period of time below 40% of the rated output it begins to over-fuel. This occurs because the injection tips began to carbonize and disrupt the fuel spray pattern.

In commercial generator standby/emergency systems where loads can vary and low output conditions can occur more frequently because of the diverse load applications, an automatic load bank is normally used. A load bank will place a "false" load on the generator system to keep the diesel engine properly loaded to prevent a "**wet-stack**" condition.

In residential or small business applications a "false" anti-wet-stack load condition can be accomplished with the use of an electric heater or other high load appliance to make sure the diesel engine generator system is not allowed to operate for prolonged periods of time below an acceptable level.

Once a diesel engine begins to "**wet-stack**" the only way to correct the problem is to load the engine for a couple of hours to burn off the excess fuel and clean up the engine. Some diesel engines are less prone to "**wet-stacking**" than others. Generally, electronically controlled engines and engines with advanced emission systems are less likely to "**wet-stack**". Unfortunately, all diesel engines will "**wet-stack**" if operated for long periods of time considerably below the rated output level. It is for this reason that proper sizing and design is important.

In AutoDISE, a warning will appear above an generator icon which is experiencing wet stacking conditions. Wet-stacking conditions are determined by the average phase load on the generator divided by the rated amperage per phase of the generator. If this percentage is less than the threshold value for wet stacking, then the warning appears. The threshold value is user-defined and can be set in Warnings Properties of the Layout Properties window.

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3.1.4 Shelters/Tents

Shelters/Tents

Shelters or Tents are temporary structures, permanent structures or vehicles within the layout which are designed to house equipment. Shelters contain electrical equipment, but do not themselves have any electrical properties.

Shelter icons are drawn with an arrow in the top-left corner to show the default orientation of the shelter in case the shelter is rotated.

Shelter Icon with Arrow

There are no restrictions on equipment that may be placed in a shelter or tent, except that a group of paralleled generators may not be SPLIT between shelters or between a shelter and the main layout.

Shelters are drawn based on the dimension specified in the icon framework.

Double-clicking on a shelter opens a Shelter Window. The Shelter Window provides a graphical layout and tabular view for adding, removing and editing items inside the shelter.

See Shelter/Tent Properties.

3.1.4.1 Shelter Right-click Options

If you right-click on a shelter, an options menu appears next to the shelter. The options that appear depend on whether the user is viewing the Main Layout or the Staking view.

Most of the option choices are discussed in Common Right-click Options. The following, however, are unique to shelters:

1. **Open Shelter Layout** (Main Layout View only)- opens the Shelter Window, just as if the user double-clicked on the shelter.
2. **Edit Icon Framework** - opens the Icon Framework Editor allowing the user to edit the current Icon Framework for the item.
3. **Assign New Icon Framework** - opens the Icon Framework Manager in **Assign Framework** mode, allowing the user to assign a new Icon Framework to this item. See Assigning a New Icon Framework.
4. **HVAC Requirements Calculator** - opens the HVAC Requirements Calculator.

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5. **Require Redundant Generators** (Main Layout View only) – turns on and off the Redundant Generator Requirement for shelters.

3.1.4.2 Demand Factor

When determining the size of a generator required for a particular set of electrical loads it is important to account for the fact that typically not all loads will be on at the same time. One way to account for this factor is through the use of the **Demand Factor**.

Demand Factor is a number between 0 and 1 which is used to calculate what percentage of connected loads will be on at the same time. For example, if the total connected load on a generator is 20 kW and the **demand factor** is 0.5, the "demand load" is 20 x 0.5 = 10 kW. In this case, a 10 kW generator is sufficient to power the connected load.

Note: ***"Demand load" is in quotation marks to help remind the user that this is NOT the same as the Demand Load calculated in the Analysis View of AutoDISE based on load duty cycles. The term "demand load" is utilized in multiple locations in Army power manuals to mean different things.***

Typically, **demand factors** are applied to the loads within a particular shelter. **Demand factors** are published for some typical Army shelters. Some examples include:

Shelter	Demand Factor
Housing	0.9
Operation facilities	0.8
Administrative facilities	0.8
Shops	0.7
Medical facilities	0.8
Laundry, ice plants, bakeries	1.0

In AutoDISE, **demand factors** are applied to shelters and can be set in the Layout Item Properties window for a shelter. The calculated loads, with **demand factor** applied, can be viewed in the Analysis View for Unpowered Loads or a particular generator.

The AutoConnect feature provides an option for using demand factor to calculate generator overload conditions. See AutoConnect, AutoConnect Main Layout window and AutoConnect Shelter Equipment window for more information.

3.1.5 Distribution Equipment

Distribution Equipment

Distribution Equipment items are used to distribute power to consumers or other distribution equipment.

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Typically, a distribution item has one power input and multiple power outputs. However, several unique distribution items have multiple inputs, allowing for multiple paralleled generator input connections.

Types of distribution equipment include DISE and Breaker Boxes, Receptacles, and Adapters. While these types have much in common, receptacles and adapters all have unique features that must be fully understood to maximize their usefulness in the program.

See Distribution Equipment Properties.

3.1.5.1 Distribution Right-click Options

If you right-click on a distribution item, an options menu appears next to the distribution item. All options shown on this menu are discussed in Common Right-click Options.

3.1.5.2 DISE and Breaker Boxes

DISE and Breaker Boxes

DISE and **breaker boxes** are used to distribute power to multiple consumers.

DISE refers to the military family of power distribution equipment (military customized electrical breaker boxes) as defined by the DISE operator and maintenance manual TM 9-6150-226-13.

Breaker Boxes refers to any custom-configured distribution box which is not a DISE.

3.1.5.3 Receptacles

Receptacles

Receptacles are single phase distribution items with a variable number of output connections. They can be utilized in three ways:

1. **Standard NEMA 5-15 receptacle** - If a layout requires single or duplex NEMA 5-15 receptacles in specific locations, the AutoDISE receptacle can be used as to represent these items and can handle as many output connections as desired.

2. **Chained receptacles** - Some wiring setups such as the M-46 have receptacles and cables which allow chaining of receptacles end-to-end. AutoDISE receptacles support chaining. To chain two receptacles, simply link them as you would any two items. As shown in the figure below, the links for chained receptacles are drawn to emphasize their chained status. Note that in this figure the input connection locations of each receptacle have been changed to the "Top" location in order to more clearly show this

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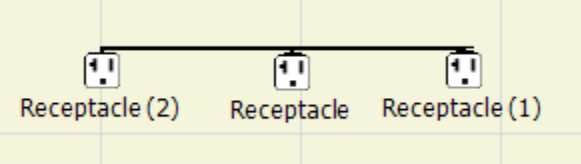
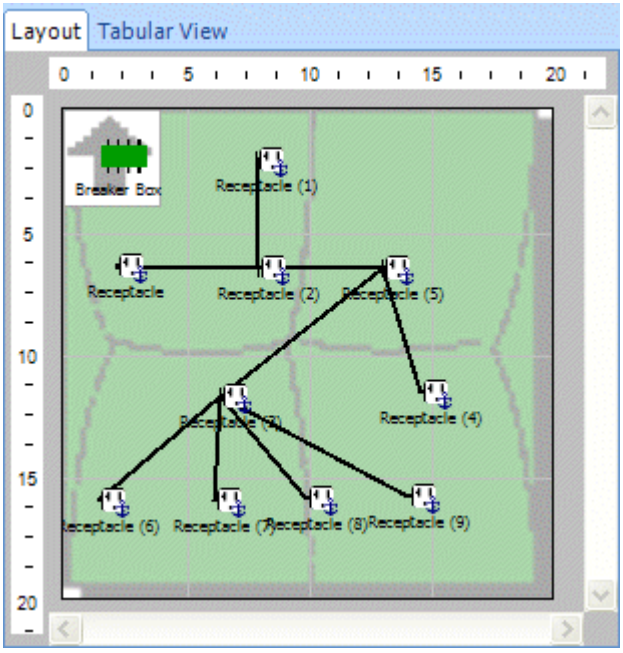
feature.



Three chained receptacles

3. **Nodes for a complicated wiring setup** - Though really simply an extension of #2 above, this approach emphasizes use of receptacles as modeling a wiring setup which utilizes special splitters and distribution items not in the toolbox. See the figure below.



Receptacles may be anchored to prevent AutoConnect from removing them during the course of its algorithm. See Anchored Receptacles for more information

3.1.5.3.1 Anchoring Receptacles

The AutoConnect algorithm treats receptacles as "disposable" items. In fact, during AutoConnect, if a receptacle is included in the AutoConnect algorithm and it is not "anchored", it will be removed from the layout.

Anchored receptacles, on the other hand, are treated like any other distribution item on the layout: they are not removed, but are "anchored" to the layout.

Receptacles added to the layout by the user using the Toolbox are anchored by default. Receptacles added by AutoDISE are not anchored by default.

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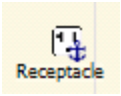
Receptacles may be anchored or unanchored by right-clicking on the receptacle and selecting **Anchor Receptacle** from the popup menu that appears.

Anchored receptacles are shown with an anchor symbol in the icon to reinforce their anchored status.



An Anchored Receptacle

3.1.5.4 Adapters

The AutoDISE Toolbox contains three special adapters:

1. **Universal Adapter** - Used to rotate phases. Universal Adapters are found in the Special Purpose section of the Toolbox.

2. **Wye Adapter**- Also known as a "Y" adapter. It has a single MILSPEC input connection and two MILSPECoutput connections.

3. **FWH Adapter** - Field Wiring Harness adapter for Marine Corps wiring harnesses. It has a single MILSPEC input connection, a single MILSPEC output connection, and two NEMA 5-15 output connections.

3.1.6 Consumers

Consumers

Consumers are electrical items that consume power, such as air conditioners, lights, coffee pots, refrigerators, etc. Consumers consist of both AC consumers and DC consumers. AC consumers can be 1-phase, 2-phase, or 3-phase. Consumers can be "daisy-chained" in Consumer Chains.

See Consumer Properties.

3.1.6.1 Consumer Right-click Options

If you right-click on a consumer, an options menu appears next to the consumer. Most of the option choices are discussed in Common Right-click Options. One, however, is unique to consumers:

- **Deactivate [or Activate]** – deactivates [or activates] the consumer, turning it on or off

3.1.6.2 AC Consumers

AC consumers can be 1-phase, 2-phase, or 3-phase. They are rated by either Watts or a combination of voltage and current.

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The 2-phase consumers are really one phase consumers that are designed to run at twice the phase-to-neutral voltage of the generator. These consumers can however operate at 208 volts and are often loaded by connecting them to two live phases of the generator; hence, the term "2-phase".

Note: Two phase consumers connected directly to two of the three phases of a generator operating in three phase, 4-wire mode will only operate at 75% of their rated capacity since they will experience the phase-to-phase voltage rather than twice the phase-to-neutral voltage (e.g., 208V rather than 240V for a 120/208 VAC generator). This can be remedied using a "two phase" transformer. See Transformers for more information.

3.1.6.3 DC Consumers

DC Consumers

DC power consumers may only be connected to DC Rectifiers or generators in DC mode. When connecting any two DC items to each other AutoDISE requires that the DC voltage rating of both items be equal.

DC consumers are rated in Watts, with a DC voltage rating in Volts.

3.1.6.4 Consumer Chains

A Consumer Chain (often called a "daisy chain") is a group of single phase consumers linked together end to end. There is no limit to the number of single phase consumers that can be chained together.

To create a consumer chain, simply activate Link Mode and manually connect two single phase consumers.

In Tabular View, consumer chains can be acted upon as a single unit. The chain is represented by a chain icon next to the consumers in the chain. See the figure below.

This chain icon may be dragged to another connection point, thereby moving the entire chain of consumers to that new connection.

In Tabular View, a user may also add and remove consumers from a chain simply by dragging a consumer to the group of consumers or by dragging a single chained consumer to a new connection, respectively.

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3.1.7 Non-Electrical Items

Non-electrical items are items which have no electrical properties, but are added to layouts to give spatial reference, such as beds in a hospital shelter.

Similar to shelters, icons for non-electrical items are sized based on the length and width of the Icon Framework.

3.1.7.1 Non-Electrical Right-click Options

If you right-click on a non-electrical item, an options menu appears next to the distribution item. Most of the option choices are discussed in Common Right-click Options. Two, however, are unique to non-electrical items:

1. **Edit Icon Framework** - opens the Icon Framework Editor allowing the user to edit the current Icon Framework for the item.
2. **Assign New Icon Framework** - opens the Icon Framework Manager in **Assign Framework** mode, allowing the user to assign a new Icon Framework to this item. See Assigning a New Icon Framework.

3.1.8 Special Purpose

Special Purpose items consist of Universal Adapters, Transformers, DC Rectifiers and Inverters.

Note: For a simple demonstration of how Special Purpose Items are used on a layout, see Sample Layout 6. To open sample layouts, open the Help menu and select Sample Layouts.

3.1.8.1 Special Purpose Right Click Options

If you right-click on a special purpose item, an options menu appears next to the item. All options shown on this menu are discussed in Common Right-click Options..

3.1.8.2 Universal Adapter

Universal Adapter

The Universal Adapter (UA) is a distribution item that is used to rotate phases to better balance the generator. Universal adapters in AutoDISE are rated at 60 Amps per phase and can rotate phases 120 or 240 degrees. The figure below shows the rotation description from the UA Layout Item Properties window for a UA connected to a 3 phase load. The diagram shows how the UA rotates the phases from the generator. In this example:

1. Phase A of the generator is powering Phase B of the 3 phase load
2. Phase B of the generator is powering Phase C of the 3 phase load
3. Phase C of the generator is powering Phase A of the 3 phase load

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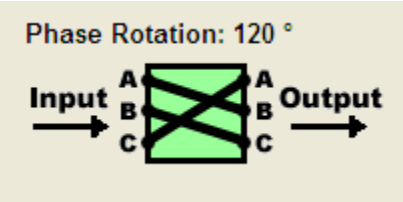

Note: For a simple demonstration of how Universal Adapters are used on a layout, see Sample Layout 6. To open sample layouts, open the Help menu and select Sample Layouts.

3.1.8.3 Transformers

Transformer

The Transformer is used to step AC voltages from one value (the input voltage) to another (the output voltage). It is assumed for AutoDISE that the efficiency of AC transformers is unity so that the power into the transformer equals the power out:

Power in = Power out

Since Power = Voltage x Current:

(Voltage x Current) in = (Voltage x Current) out

or

$$\frac{\text{Voltage in}}{\text{Voltage out}} = \frac{\text{Current out}}{\text{Current in}}$$

For example, a 24A single phase load runs at 240V, but is powered by a 120/208 VAC generator. Therefore, the single phase generator voltage of 120V must be stepped up to 240V using a 120/240V transformer. If this transformer is used, what is the load the generator actually sees?

Current in = Current out x Voltage out / Voltage in

or

Current in = (24A x 240 / 120) = 48A

Output Connections

In AutoDISE, it is assumed that single phase transformers have multiple output connections for items to connect to the transformer. Therefore, single phase transformers may connect to

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an unlimited number of single phase items at its output.

However, it is assumed that three phase transformers only have a single output connection. Therefore, AutoDISE only permits one item to be connected to a three phase transformer output.

"Two phase" Transformers

"Two phase" is an AutoDISE term used to describe transformers which are utilized to step three phase generator phase-to-phase voltages from the phase-to-phase voltage to twice the phase-to-neutral voltage. For example, a two-phase transformer steps the phase-to-phase voltage of a 120/208 VAC three phase generator from 208V to 240V.

Why do this? The purpose of this transformer is to allow a two phase consumer to experience the full rated voltage to which it is designed. As an example, consider a 100A two phase ECU designed to operate at 240V. A generator operating in single phase, 3-wire mode would provide the 240V necessary to operate the consumer at its rated voltage. However, a generator operating in the more common three phase, 4-wire mode would only provide 208V across any of the two live phases. Therefore, the two phase consumer would only operate at 75% of its rated voltage. The two phase transformer steps the 208V phase-to-phase up to 240V so that the two phase consumer can run at full capacity.

Note: For a simple demonstration of how Transformers are used on a layout, see Sample Layout 6. To open sample layouts, open the Help menu and select Sample Layouts.

3.1.8.4 DC Rectifiers

DC Rectifier

The DC Rectifier is used to connect DC items such as DC consumers or Inverters to an AC power grid. Rectifier rating is specified in kilowatts and its output DC voltage in Volts.

The rectifier input connection is AC and may connect to any AC single phase output connection of compatible rating and equivalent AC voltage. Rectifier outputs may only be connected to a DC item with an equivalent DC voltage rating.

Note: For a simple demonstration of how DC Rectifiers are used on a layout, see Sample Layout 6. To open sample layouts, open the Help menu and select Sample Layouts.

3.1.8.5 Inverters

Inverter

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The inverter is used to connect AC items to a DC power grid, typically powered by a DC Generator. Inverter rating is specified in kilowatts and its output AC voltage in VAC.

The inverter input connection is DC and may connect to any DC output connection of compatible rating and DC voltage. Inverter outputs may only be connected to an AC item with an equivalent AC voltage.

Note: For a simple demonstration of how Inverters are used on a layout, see Sample Layout 6. To open sample layouts, open the Help menu and select Sample Layouts.

3.2 User-defined Equipment

User-defined equipment may be added and edited in the AutoDISE Toolbox. Any such equipment added will ONLY exist in the Toolbox of the computer on which the program was running when the equipment was added.

Note: Once user-defined equipment is actually added to a layout, the equipment on that layout is saved in the layout file and is now completely independent of the Toolbox.

Therefore, other users will be able to open that layout on other computers and view the equipment on the actual layout even though THEIR Toolbox may not contain those user-defined items.

See Adding New Equipment and Editing Existing Equipment.

3.2.1 Adding New Equipment

To add new user-defined equipment to the Toolbox, simply select **Add New Item to Toolbox** from the Toolbox Menu and then select which item it is you wish to add from the submenu that appears.

For shelters and non-electrical items, a preliminary window will appear requesting the item length and width. Enter the item length and width in feet and inches and click **Continue**.

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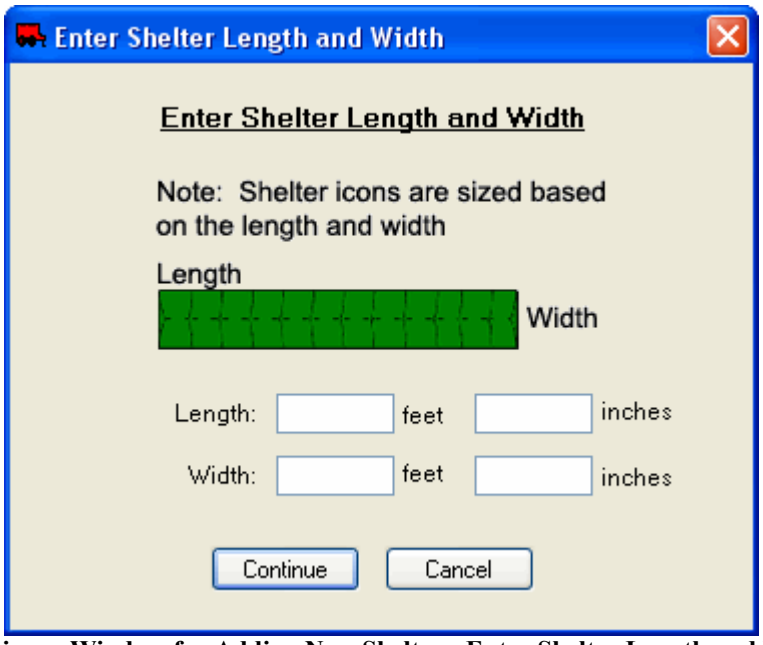

Preliminary Window for Adding New Shelter - Enter Shelter Length and Width

A window will appear for adding your specified item type.

See Adding Generators, Adding Consumers, Adding Transformers, Adding DC Rectifiers, Adding Inverters, Adding Distribution Equipment, Adding Non-Electrical Items, and Adding Shelters/Tents.

Alternative Method

A second method for adding user-defined items to the Toolbox is to add an existing Toolbox item to a layout, modify its properties, then right-click on the item and select **Save Item to Toolbox**.

For shelters, this method also saves all internal items and links, ***except for links between paralleled generators and distribution items and the communication links between paralleled generators.***

3.2.2 Editing Existing Equipment

User-defined equipment in the Toolbox may be edited. This can be done in one of three ways:

1. Open up the Toolbox and right-click on the desired item. Select **Properties** from the menu that appears. The Toolbox Item Properties window appears. See Toolbox Item Properties for information on how to edit particular pieces of equipment.

2. Select **View Toolbox Items** from the Toolbox menu. The Toolbox Item Properties window appears. Click on the left side of the window to select the toolbox item you

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wish to edit. See Toolbox Item Properties for information on how to edit particular pieces of equipment.

3. Add a Toolbox Item to a layout, modify the item then right-click on the item and select **Save Item to Toolbox** from the menu that appears. If the name of the item is identical to the name of an item already in the Toolbox, regardless of type, AutoDISE will prompt the user for whether they wish to overwrite the existing item. To save an item as a new item the user must give the item a unique name prior to saving.

   Note: Method 3 is only of practical use for shelters and tents. This method allows a user to modify the contents of a shelter, including links, and then save the shelter and contents directly into the Toolbox.

3.3 Toolbox Cables

Toolbox Cables are the actual electrical cables contained in the AutoDISE Toolbox. Links and electrical cables are related, but are not exactly the same. See Links for more information.

To view the cables in the Toolbox, select **View Toolbox Cables** from the Toolbox Menu. The Cable Properties window appears. A sample cable is shown below.

Cables in the Toolbox are either system-defined or user-defined. ***System-defined*** cables are standard cables currently in use and may not be modified. ***User-defined*** cables are individually entered by a user and are local to the computer on which they were defined.

Note: Cables are, by default, not attached or associated with individual layouts. Therefore, user-defined cables added to the Toolbox on one computer will not appear in the Suggested Cables for a link on another computer, UNLESS the Layout Properties of the layout (or Link Properties for a specific link) are modified to specify the set of cables to be used.

The rules for how cable suggestions are made by AutoDISE are detailed in Suggested Cables for a Link.

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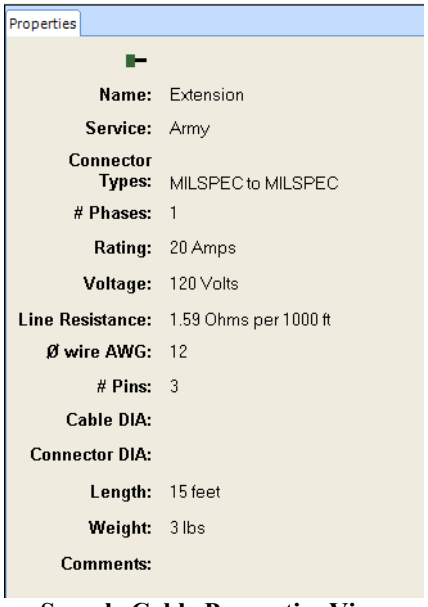

Sample Cable Properties View

Cables are defined in AutoDISE primarily by their name, service, end connector types, number of phases, rating in Amps and length.

To view the Suggested Cables for a Link, right-click on the link and select **Properties** from the popup menu. Suggested cables are shown in the Link Properties window.

3.4 User-defined Cables

User-defined cables may be added and edited in the AutoDISE Toolbox. Any such cables added will ONLY exist in the Toolbox of the computer on which the program was running when the equipment was added, subject to the following note:

Note: Cables are, by default, not attached or associated with individual layouts. Therefore, user-defined cables added to the Toolbox on one computer will not appear in the Suggested Cables for a link on another computer, UNLESS the Layout Properties of the layout (or Link Properties for a specific link) are modified to specify the set of cables to be used.

The rules for how cable suggestions are made by AutoDISE are detailed in Suggested Cables for a Link.

See Adding New Cables and Editing Existing Cables.

3.4.1 Adding New Cables

To add new user-defined cable to the Toolbox, simply select **Add New Cable to Toolbox** from the Toolbox Menu.

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A Toolbox - Add New Cable window will appear.

3.4.2 Editing Existing Cables

User-defined cables in the Toolbox may be edited.

To edit a user-defined cables, select **View Toolbox Cables** from the Toolbox menu. The Cable Properties window appears. Click on the left side of the window to select the user-defined cable you wish to edit.

See Editing Cables in the Toolbox for more information

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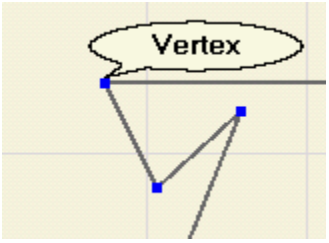
Part

4 Links

Equipment on a layout is electrically connected via links.

Links and electrical cables are related, but are not exactly the same. A link is an AutoDISE concept which represents one or more actual interconnected cables that would be used to electrically connect two pieces of equipment. Put another way, one and only one link can connect two items on a layout, but that link could be made up of one or more electrical cables to create that connection.

Links may contain link vertices, or points where links bend or change direction. See the figure below.



Link Vertex

The link vertex has no real-life correlation. The link vertex is used solely for drawing purposes to allow the user to easily route links to most effectively represent actual cable layouts. However, the length of the a link is determined by its actual drawn length and this in turn affects what cables are suggested for a link and the voltage drop values calculated for a link in the Analysis View. See Link Vertices for more information.

Links are connected to items via item input and output connections. Input connections are defined as the connections which are closest to the power source, or the connection which current flows "into". Connections are distinguished by rating, number of phases and connector type.

When drawing links on a layout, AutoDISE must determine from where on an item a link should emanate. This is determined by connection locations, which has no real-life correlation, but exists purely for drawing purposes. See Connection Locations information on how to modify connection locations.

For shelters and tents, the shelter connection locations are determined by where links penetrate the shelter perimeter. These locations are visible when viewing a shelter layout and may be dragged to any point on the shelter perimeter. See Shelter Connection Locations for more information.

See also: Creating a Link, Deleting a Link, AutoRouting a Link, Straightening a Link, Locking and Unlocking a Link and Electrical Cables.

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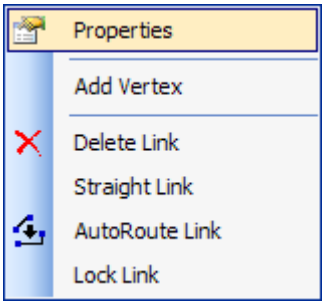
4.1 Right-click Link Options

The right click options for links is displayed below.



Link Right-click Options

- **Properties** - Opens the Link Properties window.
- **Add Vertex** - Adds a vertex to the link at the point the user right-clicked the link.
- **Delete Link** - Deletes the link from the layout permanently
- **Straight Link** - Removes all vertices from the link.
- **AutoRoute Link** - AutoRoutes the link
- **Lock/Unlock Link** - Locks or unlocks the link.

4.2 Connector Types

Connector types define the actual physical type of electrical connector used for that connection. AutoDISE currently recognizes seven separate connector types:

1. **Pigtail -** A method of attaching bare wires to an electrical post, typically on a generator or the output of a universal adapter.

2. **MILSPEC** - Cables defined by MIL-C-5015 (common colloquial term is "Amphenol" cables)

3. **IEC-309** - (also called **IEC 60309** as of 1999**)** is international standard from the International Electrotechnical Commission for "plugs, socket-outlets and couplers for industrial purposes".

4. **NEMA 5-15 -** standard domestic AC power plugs and sockets .

5. **CAM-16** - Cam-Type, Series 16 connector.

6. **Compression** - Compression type connector.

7. **DC -** Any and all types of DC connectors.

Connector types are used by AutoDISE for suggesting cables for links, which are in turn used

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for all voltage drop calculations.

4.3 Connection Locations

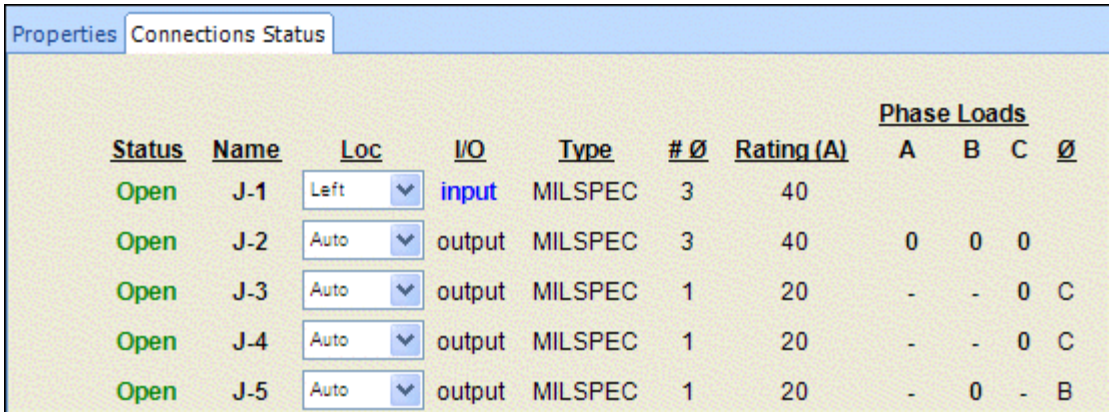
All AutoDISE links emanate from items on the layout in one of five specific locations: **Left**, **Right**, **Top**, **Bottom**, or **Auto**. The only exception to this is shelters which are discussed in Shelter Connection Locations.

By default, input connections for all items except consumers are set to **Left** while all outputs connections and the consumer input connections are set to **Auto**. AutoDISE uses these locations to determine how to draw links emanating from items on the layout.

The following rules apply:

1. Input connections (except on consumers) can not be set to **Auto**.
2. Connections set to **Auto** allow AutoDISE to pick the closest side to the next nearest vertex on the link, thereby minimizing the link length. This keeps the layout clean and easier to understand.
3. Output connections may be set to any location, but may NEVER be set to the same location as the input connection.

Connection locations may be modified by right-clicking an item, selecting **Properties**, then clicking on the **Connections Status** tab of the **Layout Item Properties** window. Finally, click on the **Edit** button. Drop-down boxes are located next to each connection with available location options shown. See the figure below.


Properties
Connections Status
Phase Loads
Status Name Loc I/O Type # Ø Rating (A) A B C Ø
Open J-1 Left input MILSPEC 3 40
Open J-2 Auto output MILSPEC 3 40 0 0 0
Open J-3 Auto output MILSPEC 1 20 - - 0 C
Open J-4 Auto output MILSPEC 1 20 - - 0 C
Open J-5 Auto output MILSPEC 1 20 - 0 - B

Connections Status Tab of the Layout Item Properties Window

4.4 Shelter Connection Locations

Shelter Connection Locations are the points along a shelter perimeter where a link between an item in the shelter and an item not in the shelter will penetrate.

When a link that penetrates a shelter perimeter is first created, AutoDISE chooses the **Shelter**

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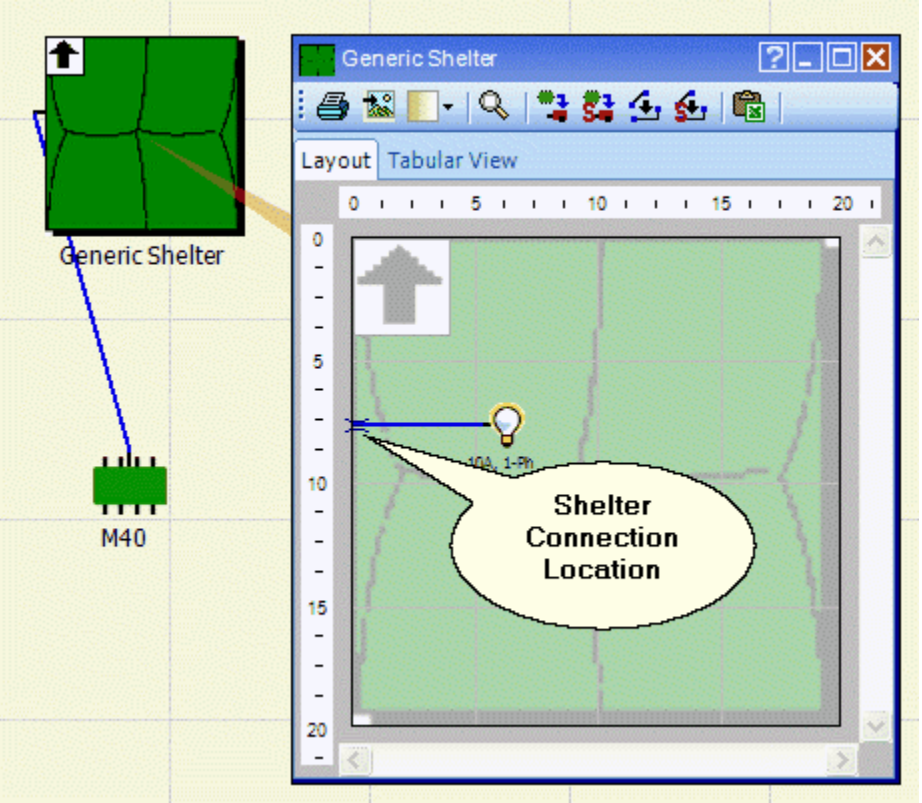
Connection Location for you, typically selecting the closest wall and moving perpendicularly from the item inside the shelter to the wall.

However, once a **Shelter Connection Location** is defined, the user has full control to move that location to any point on the shelter perimeter by simply moving the mouse over the location and clicking and dragging it to any other location.



Shelter Connection Location

4.5 Creating a Link

Links between items on a layout may be created using one of three methods:

1. **Manual Connect** - user activates Link Mode, selects items to connect, then selects connections to connect using the Select Link Connections window.

2. **AutoConnect** – AutoDISE automatically connects all selected items and determines an efficient and balanced solution.

3. **Tabular View** - Tabular View contains a tree structure representing the items on a layout. The "nodes" of this tree may be dragged around, thereby modifying the link structure of the layout. For more detail, see Dragging and Dropping Nodes for the Tabular View.

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4.5.1 Manual Connect

Manual Connect is a method used to connect two items on a layout where the user has total control over how the connection is made. In comparison with AutoConnect, manual connect requires more time and effort by the user, but gives the user far more control as to which items are connected and which connectors and phases to use.

In addition, manual connect can be used to purposely overload a generator, whereas AutoConnect will not. Such a scenario might be required if the user were testing certain connections or was midway through a connection scheme and knew the end result would result in no overloading.

Note: If a generator or a distribution unit IS overloaded a warning pop up will appear and the overloaded item(s) will be highlighted in a red border.

The steps listed below describe how to manually connect two items:

1. Click on the Link Mode button L located on the Main Toolbar. You are now in link mode and your mouse icon will appear as an "L".

2. Mouse over the first item to connect; it is now be highlighted with a thick blue border.

3. Click and drag from the first item to the second.

Manually Linking Two Items

4. When both items are highlighted, release the mouse button. The Select Link Connections window will then appear in most situations.

   There are situations where AutoDISE will automatically make the connection and the Select Link Connections window will not appear. This happens when no additional information is required. Examples include:

   - ***When chaining two single phase AC consumers***
   - ***When connecting a DC consumer to an DC Rectifier***
   - ***When connecting a single phase AC consumers to a receptacle***

5. Choose the desired connectors from each item and click on the Connect button.

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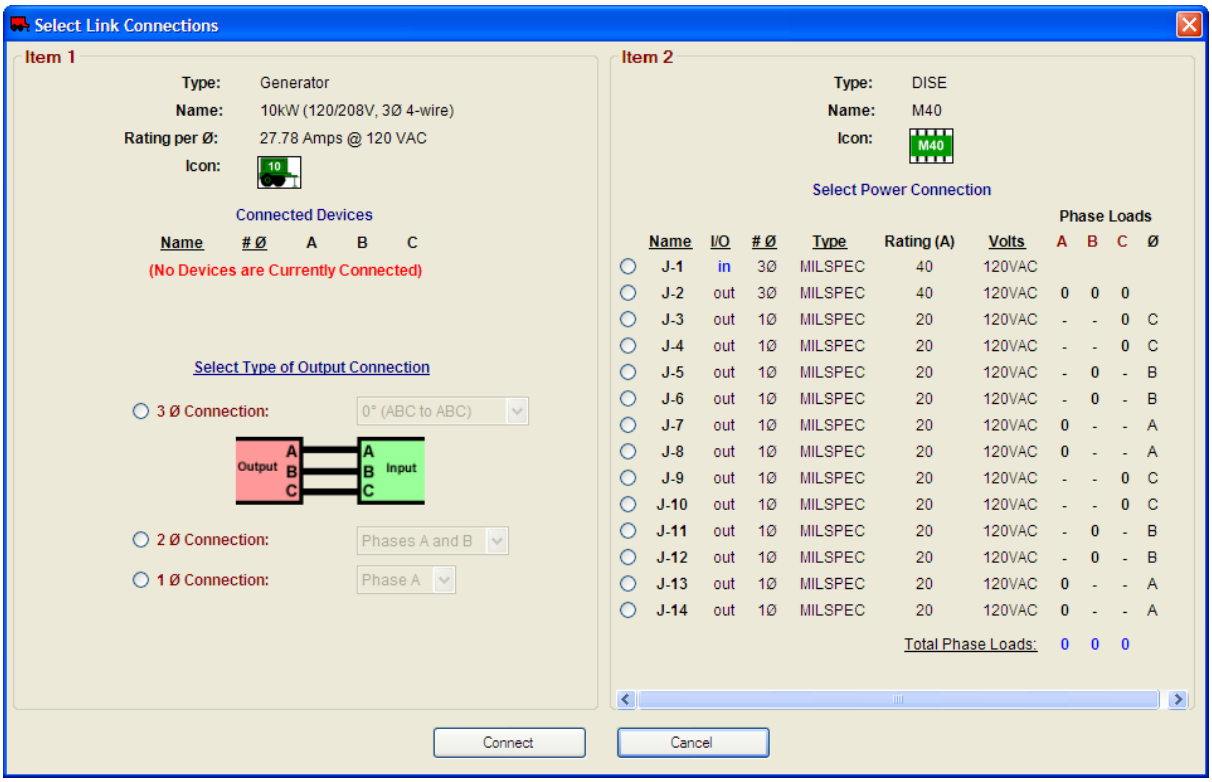
Select Link Connections
Item 1
Type: Generator
Name: 10kW (120/208V, 3Ø 4-wire)
Rating per Ø: 27.78 Amps @ 120 VAC
Icon:
Connected Devices
Name # Ø A B C
(No Devices are Currently Connected)
Select Type of Output Connection
3 Ø Connection:
0° (ABC to ABC)
Output A B C
A B C Input
2 Ø Connection:
Phases A and B
1 Ø Connection:
Phase A
Item 2
Type: DISE
Name: M40
Icon:
M40
Select Power Connection
Phase Loads
Name I/O # Ø Type Rating (A) Volts A B C Ø
J-1 in 3Ø MILSPEC 40 120VAC
J-2 out 3Ø MILSPEC 40 120VAC 0 0 0
J-3 out 1Ø MILSPEC 20 120VAC - - 0 C
J-4 out 1Ø MILSPEC 20 120VAC - - 0 C
J-5 out 1Ø MILSPEC 20 120VAC - 0 - B
J-6 out 1Ø MILSPEC 20 120VAC - 0 - B
J-7 out 1Ø MILSPEC 20 120VAC 0 - - A
J-8 out 1Ø MILSPEC 20 120VAC 0 - - A
J-9 out 1Ø MILSPEC 20 120VAC - - 0 C
J-10 out 1Ø MILSPEC 20 120VAC - - 0 C
J-11 out 1Ø MILSPEC 20 120VAC - 0 - B
J-12 out 1Ø MILSPEC 20 120VAC - 0 - B
J-13 out 1Ø MILSPEC 20 120VAC 0 - - A
J-14 out 1Ø MILSPEC 20 120VAC 0 - - A
Total Phase Loads: 0 0 0
Connect
Cancel

Select Link Connections Window

Manual Connect will only allow viable links. The following rules apply:

1. One connector must be input and the other output.
2. Both connectors must have the same number of phases and matching voltages.
3. The ratings of each connection must be compatible. ***Note: This rule will not prevent links between connections that are not compatible. However, it WILL cause a warning box to appear that informs the user that a non-traditional link is being created and that cables supporting such a link may not be available.***

If the connect was successful, the link now appears between the two items.

Note: Manual links are susceptible to being removed by AutoConnect unless they are locked. If a user adds a manual link and desires that specific link to remain connected no matter what, it is recommended that the link be immediately locked. If the link is not locked, AutoConnect might disconnect the link prior to running. Put another way, it is a good practice to lock any manual link which is performed intentionally and which will exist for some time.

4.5.2 AutoConnect

The **AutoConnect** feature for the main layout automatically and efficiently connects all selected items to each other. The algorithm runs completely separate routines for each AC voltage represented in a layout.

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There are two locations from which to select AutoConnect: on the main layout and inside a Shelter Window. For running AutoConnect on the main layout, either click the AutoConnect button on the Main Toolbar or select **AutoConnect** from the Tools Menu. If running AutoConnect only on items in a particular shelter, run AutoConnect by either clicking the AutoConnect button on the Shelter Window Toolbar or selecting **AutoConnect - [*shelter name*]** from the Tools Menu (an option to AutoConnect items in a particular shelter will only exist if the shelter's Shelter Window is open on the main layout).

Requesting AutoConnect on the main layout will bring up the AutoConnect Main Layout window, while requesting AutoConnect for shelter equipment brings up the AutoConnect Shelter Equipment window. Each window provides several more options for how AutoConnect should be run. See those sections for more detail.

In each case, the user always has two options: **AutoConnect** or **AutoConnect Selected**. **AutoConnect Selected** is unique in that it excludes from change any items that are not directly selected on the applicable layout. ***The only exception to this rule is paralleled generators. Selecting at least one paralleled generator automatically adds the entire paralleled generator group to the AutoConnect sequence.***

AutoConnect also provides the option of whether to use the demand factor for calculating generator overload conditions. AutoConnect will never intentionally overload a generator. If this option is checked, AutoConnect will determine whether the generator is overloaded by using the consumer loads with demand factor included in the calculation. This will allow more loads to be connected to the generator if shelter or main layout demand factors are less than unity and when the generator maximum load is the restrictive item in the calculations. ***Note: Demand factors do NOT affect the determination of whether distribution equipment is overloaded.***

The logic flowcharts for AutoConnect are located in Appendix B. First, consumers are connected to available distribution equipment. Then, the loaded distribution equipment is connected to larger distribution equipment or to available generators. These connections are based on proximity, available power, and phase type. The hierarchy for which items are connected is established in the DISE manual.

The following apply:

1. If **AutoConnect Selected** is chosen, only items that are selected on the appropriate layout will be included in the AutoConnect process. If on the main layout, selecting a shelter means that all items within that shelter are subject to AutoConnect.

2. All unlocked links that exist between items subject to AutoConnect will be disconnected before the connection process begins. If the user chooses **AutoConnect Selected**, unlocked links connected to non-selected items will not be disconnected.

3. For three-phase generators, consumers may be rearranged within their respective distribution item to best balance the generator.

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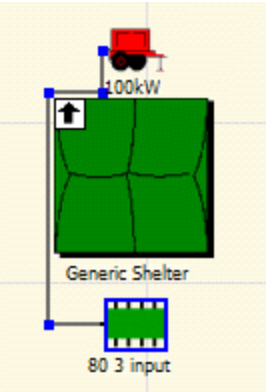
4. Transformers and inverters are never used in AutoConnect.

4.6 Vertices

A vertex on a link is a visual joint represented by a small square box along the link on the main layout.

Note: The link vertex has no real-life correlation. The link vertex is used for drawing purposes to allow the user to easily route links to most effectively represent actual cable layouts. However, the length of the a link is determined by its actual drawn length and this in turn affects what cables are suggested for a link and the voltage drop values calculated for a link in the Analysis View.

The vertices are used to put bends in a link. These bends are often used to cable around items and make the layout appear cleaner.



Link Routed Using Vertices

See also: Adding a Vertex, Removing a Vertex, Moving a Vertex

4.6.1 Adding a Vertex

The user can add a vertex anywhere on a link on the main layout.

To create a vertex, simply mouse over a link until it is highlighted, right click, and select **Add Vertex** from the popup menu that appears.

A link can have multiple vertexes on it, and there is no limit to the number of vertices allowed.

4.6.2 Removing a Vertex

The user may remove a vertex by right-clicking on it and selecting **Remove Vertex** from the popup menu that appears.

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4.6.3 Moving a Vertex

The user may move a vertex by moving the mouse over the desired vertex, clicking and dragging it to the desired location.

4.7 Deleting a Link

To delete a link, right-click on the desired link and select **Delete Link** from the popup menu that appears.

4.8 AutoRouting Links

AutoRoute is a feature in AutoDISE which automatically adds vertices to one or more links such that the links do not cross under or over any item on the layout, are composed only of horizontal and vertical link segments and are of the shortest possible length.

AutoRoute is designed to clean up a layout and provide a starting point for the user to move links to their actual positions. It is not intended as the "perfect" solution for every layout; the algorithm cannot possibly know all of the real-life restrictions that determine an actual cable layout.

There are several options to AutoRouting links:

1. AutoRoute all links on the main layout. Do this by selecting **AutoRoute** or **AutoRoute - Main Layout** from the Tools Menu or click the **AutoRoute** button from the Main Toolbar.

2. AutoRoute selected links on the main layout. Do this by selecting **AutoRoute Selected** or **AutoRoute Selected - Main Layout** from the Tools Menu or click the **AutoRoute Selected** button from the Main Toolbar.

3. AutoRoute all links on a shelter layout for a Shelter Window that is open. Do this by selecting **AutoRoute - [*shelter name*]** from the Tools Menu or click the **AutoRoute** button from the Shelter Window Toolbar.

4. AutoRoute selected links on a shelter layout. Do this by selecting **AutoRoute Selected - [*shelter name*]** from the Tools Menuor click the **AutoRoute Selected** button from the Shelter Window Toolbar.

4.9 Straightening a Link

The user may straighten a link (remove all the link vertices) by right-clicking on the desired link and selecting **Straighten Link** from the popup menu that appears.

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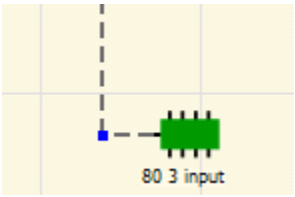
4.10 Locking and Unlocking a Link

***Note*: Locking a link is an AutoDISE feature that has no real world correlation.**

The purpose of locking links is to prevent AutoConnect from disconnecting the link during its routine. This is especially important in situations where the user has manually connected two items and does not wish that link to be removed automatically.

***Note*: Locking a link locks two items together, but does not guarantee that the connections originally used will be preserved. AutoConnect has a phase balancing routine that may switch the connection used by a locked link to better balance across the distribution item or generator, but will only switch to a connection on the same item to which it was originally locked.**

The user may lock a link on the main layout by right-clicking on a link and selecting **Lock Link** from the popup menu that appears. Once locked, a link will be drawn as a dashed line on the layout.



A Locked Link

The user may unlock a link on the main layout by right-clicking on a link and selecting **Unlock Link** from the popup menu that appears.

***Note*: For paralleled generators, if any link is locked between any one of the paralleled generators and a distribution item, ALL links between paralleled generators in that group and the distribution item will also be locked automatically**

4.11 Suggested Cables for a Link

For every link in a layout, AutoDISE will provide a list of electrical cables that are suggested for building that link.

The approach for suggesting cables for a link has two distinct steps:

1. **Determine the set of cables from which cable suggestions may be taken**:

   - By default a new layout will draw from ALL system-defined and user-defined cables currently available in the Toolbox.
   - A user may restrict the cable set to a specific list of cable types. This restricted set can be defined on a whole-layout basis using the Cables tab in the Layout Properties window, and/or on a link-by-link basis using the Link Properties window. See help for these windows for specific instructions for defining

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restricted cable sets.

Note: If the cable set is restricted on both a layout AND a particular link on that layout, the cable set for that link takes precedent over the layout cable set. For example, a user goes into Layout Properties and restricts all links on the layout to cable A and cable B. The user then goes to Link Properties for a link, call it link AA, and restricts the cables on this link to cable A, cable B and cable C. In this case, AutoDISE will suggest cables for this particular link using the cable set defined for the link, thereby including cable C, even though cable C was NOT defined at the layout level.

2. **Run a standard algorithm for selecting cables from this fixed cable set**. The methodology used for this step is shown in Appendix C.

These suggested links appear or are utilized in three places:

1. **Link Properties**: Right-click on a link and select **Properties** from the popup menu that appears. Suggested cables are shown in the Link Properties window.

2. **Voltage Drops**: To calculate voltage drops for a particular link, AutoDISE must select cables and calculate values based on the gauge and load of the cable. The cables used are the cables shown in 1. above.

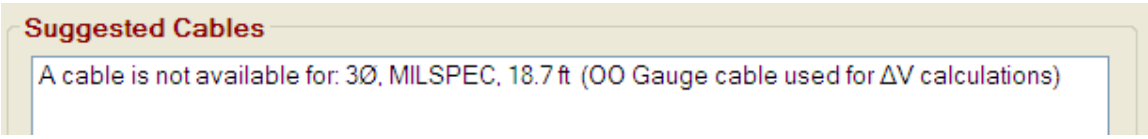
3. **Inventory Views**: A compilation of suggested cables for the entire layout appear in the Inventory Views.

Note: Three phase cables and single phase cables are handled differently:

- **Three phase cable suggestions are ONLY taken from the list of cables available in the AutoDISE Toolbox. This means that the resulting cable length is oftentimes longer than the link length.**

  For example, a three phase, 80A, 40ft Pigtail-to-MILSPEC link requires 54 feet of cable: 1 4ft Pigtail-to-MILSPEC adapter and one 50ft 100A cable.

  Note: If a cable of the required specifications is not available in the Toolbox, a note to that effect will appear in the suggested cables section of the Link Properties window. See the image below.



Example Where 3 Phase Cable of Required Specifications Not Available

- **Single phase cables are similarly treated if the upstream connection is not NEMA**

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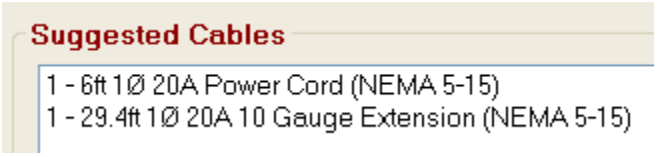
5-15. However, if the upstream connection IS NEMA 5-15, it is recognized that any number and variety of extension cords exist to meet the needs of this link. Therefore, for these links, any remaining link distance is summarized with an exact measurement of 10 Gauge NEMA 5-15 cable which does not exist in the Toolbox. See the figure below for an example. See Appendix C for more information.



Example of NEMA 5-15 Suggested Cables

4.12 Voltage Drops

AutoDISE calculates the **voltage drop** for one phase of a cable using the following formula:

Voltage Drop = 2 * [phase load] * [line resistance per 1000 ft] * [cable length in feet]

where:

phase load = current in Amps carried in that phase of the cable
line resistance per 1000 ft = resistance in Ohms per 1000ft of the cable

Line resistance per 1000 ft is calculated using the gauge (AWG) of the cable:

Line resistance per 1000 ft = $1.26^{(AWG - 10)} / 1000$

The voltage drop for one phase of an entire link is simply the sum of voltage drops for each cable suggested for the link. To view the voltage drop per phase for a link, move the mouse over a link and pause until the link info balloon appears. Voltage drops are located at the bottom of the balloon.

Voltage drops per phase are also calculated between a consumer and the generator which is powering that consumer by simply adding up the voltage drops per phase for all links between the consumer and generator. These values may be viewed in the Generator Load Summary and Statistics for that generator in the Analysis View.

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Part V

5 Icon Frameworks

Icon Frameworks define the shape and dimensions of a shelter or non-electrical item. Icon frameworks can be a variety of pre-defined shapes and custom shapes and may also be defined with text embedded in the framework. Specific options and capabilities are defined in Icon Framework Editor.

Note: Icon Frameworks currently only apply to shelters and non-electrical items. All other items, except passageways can only be resized using the Change Icon Size feature in Common Right-click Options.

The default icon framework dimensions are based on the physical length and width of the item as defined in the Toolbox.

For shelters used for staking of DEPMEDS layouts, the icon framework can also define the location and orientation of shelter accesses, or locations where passageways can connect, as well as the location of staking nodes. When used in this manner, it can be referred to as a " staking framework".

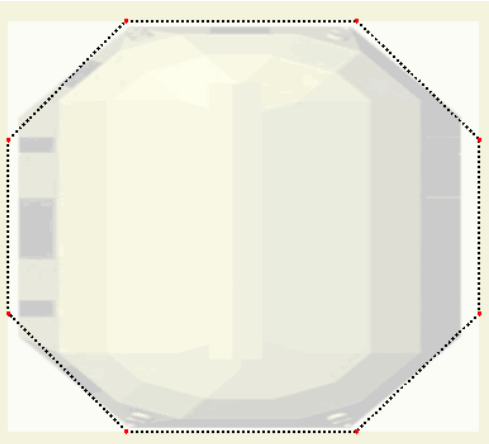
Icon Frameworks may be stored and managed in the Icon Framework Manager. In this window, a user may view existing frameworks, and add/edit/delete user-defined frameworks.

Icon Frameworks may be edited by the user. Specific editing rules apply depending on the item type in question.

See also: Assigning a New Icon Framework, Editing an Icon Framework, and Building a Staking Layout.

Basic Terminology

A standard octogonal icon framework and a 2:1 ISO staking framework are shown below. The "staking framework" is an icon framework which also has shelter accesses and staking nodes and is used for developing DEPMEDS staking layouts.



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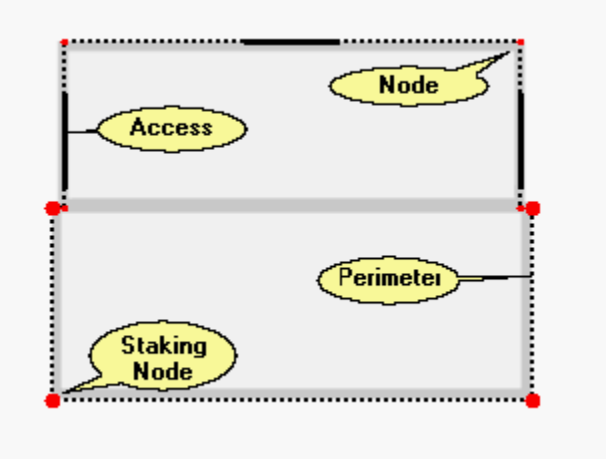
Standard Icon Framework



ISO 2:1 Staking Framework

- **Perimeter**: A dotted line defines the exterior perimeter of the framework. The length and width of a framework is defined by the smallest rectangle in which the entire framework would fit.

- **Node**: A node is simply a location where the perimeter makes a 90 degree turn.

- **Staking Node**: A staking node is a node that will appear on the staking layout. Typically, the staking nodes area the four outside corners of a shelter. However, as is the case of the 2:1 ISO framework, the staking nodes are the location of the original ISO container corners prior to unfolding of the sides.

  Note: In the current version of AutoDISE, there must be exactly four staking nodes which form a perfect rectangle. This requirement is enforced when building or modifying a framework using the Edit Icon Framework and Create New Icon Framework windows.

- **Access**: Shelter accesses are shown by a solid line. Shelter accesses define locations where passageways may connect to a shelter via the framework and are defined by their location, width and type. See Shelter Accesses for more detailed information.

5.1 Editing an Icon Framework

Icon frameworks already assigned to an item may be edited using one of two methods:

1. Right-click on the desired item and select **Edit Icon Framework** from the menu that appears. This opens the Edit Icon Framework window. See Edit Icon Framework window for more information

2. Open the Layout Item Properties window for the desired item and click on the **Icon Framework** tab. Click on the **Edit Button** to edit the item, then click the **Edit Framework** button to open the Edit Icon Framework window. See Edit Icon

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Framework window for more information

Specific editing rules apply depending on the item type in question.

5.2 Assigning a New Icon Framework

A new icon framework may be assigned to an item using one of two methods:

1. Right-click on the item select **Assign New Icon Framework** from the menu that appears. This opens the Icon Framework Manager in **Assign Framework** mode. Select the desired framework and click the **Select** button to assign the framework.

   The user may add, edit and delete frameworks within the **Icon Framework Manager** prior to selecting a framework to assign. See Icon Framework Manager for instructions for how to use this window.

2. Open the Layout Item Properties window for the desired item and click on the **Icon Framework** tab. Click on the **Edit Button** to edit the item, then click the **Edit Framework** button to open the Edit Icon Framework window. Within this window is an option to copy a framework from an existing framework. See Edit Icon Framework window for more information

Specific editing rules apply when assigning new frameworks, depending on the item type in question.

5.3 Icon Framework Shapes

Icon frameworks can only have one of the following shapes:

1. Hexagonal
2. Octogonal
3. Half-octogonal
4. Decagonal (10 sides)
5. Circular (modeled as a 20-sided polygon)
6. Rectangular
7. Polygon with more than 4 sides where all sides are at 90 degrees to the layout (also called "orthogonal")

Use the Icon Framework Editor to set frameworks to specific shapes. The Icon Framework Editor is available in the Create New Icon Framework and Edit Icon Framework windows.

See also: Assigning a New Icon Framework and Editing an Icon Framework.

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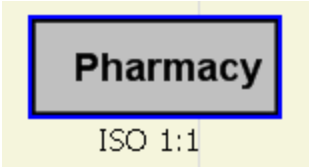
5.4 Icon Framework Textboxes

Users can embed textboxes in icon frameworks. When viewed on a layout, the text in these textboxes appears as an overlay on top of the item icon image.

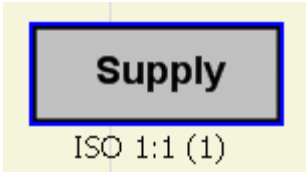
This feature can be useful for embedding item names or information into the graphical image of an item on the layout without having to embed the information directly in the icon image using an external image editor. In addition, since frameworks get copied when an item is copied, this makes it easy to copy an item with an embedded textbox in the framework and then quickly edit the textbox on the new item's framework to show different text on the new item.

For example, the text "Pharmcy" as been embedded in the framework of the shelter shown below:



Shelter with Embedded Textbox

Now, this shelter is copied and pasted on the same layout and the new item's framework is edited, changing the embedded textbox text to "Supply":



Copied Shelter with Text Edited

No image editor was required to make this change. It only required a simple edit to the text in the embedded textbox.

Use the Icon Framework Editor to add/edit/delete textboxes from the icon framework. The Icon Framework Editor is available in the Create New Icon Framework and Edit Icon Framework windows.

See also: Assigning a New Icon Framework and Editing an Icon Framework.

5.5 Icon Framework Editor

Icon Framework Editor features are available in the Create New Icon Framework and Edit Icon Framework windows.

Using the Icon Framework editing features to modify a Icon Framework consists of moving perimeter walls, moving drag nodes (specific shapes only), assigning shapes, adding and

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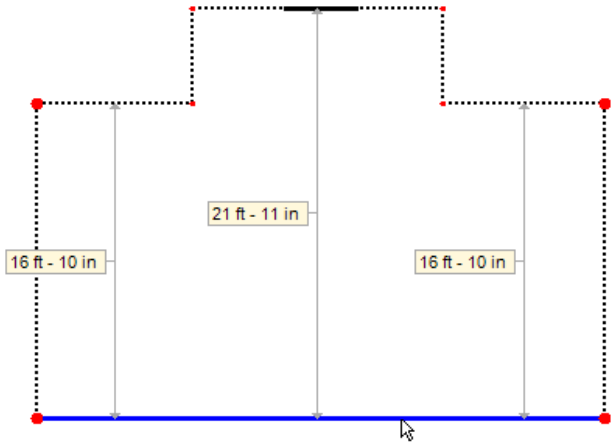
editing textboxes, editing icons and adding/removing nodes. For shelters with orthogonal frameworks, this also includes setting/unsetting staking nodes and adding/removing/editing accesses:

- Moving perimeter walls: To move a perimeter wall, move the mouse over the desired wall until it is highlighted, then click and drag the wall in a direction perpendicular to the wall.



Moving a Perimeter Wall

For non-orthogonal frameworks, specific shapes respond to this dragging movement in different ways:

1. **Hexagons**: Only the horizontal or vertical walls of a hexagon may be moved. Hexagons have unique "drag nodes" which may also be moved. See moving drag nodes.
2. **Octagons and half-octagons**: All sides of an octagon or half-octagon may be moved. Moving horizontal and vertical sides affects the overall dimension of the octagon, while dragging angled sides adjusts only the length of all angled sides.
3. **Decagons and Circles (20-sided polygons)**: There are no sides of decagons or circles which may be moved. Instead, use one of the four "drag nodes" to resize the framework.

- Moving drag nodes: Hexagons, decagons and circles, which are modeled as 20-sided polygons, having unique "drag nodes" which allow manipulation of the framework. These drag nodes are yellow. When a user moves the mouse over one of these nodes and clicks, they may drag the node to change the shape of the framework.

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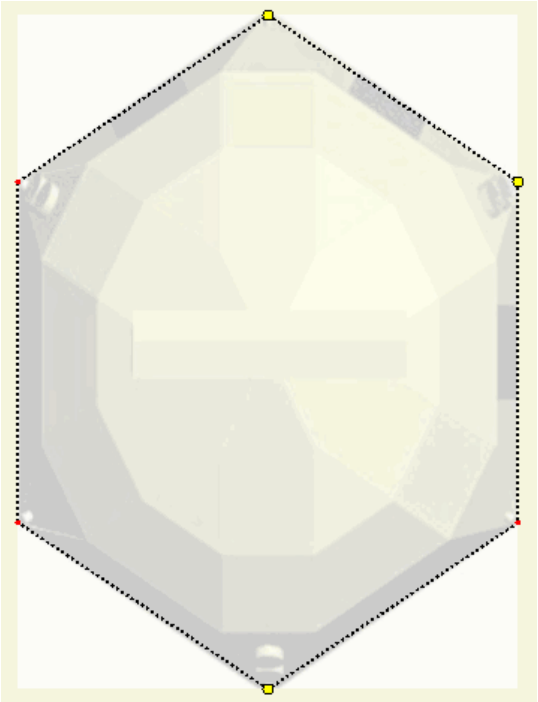

Hexagonal Framework with 3 Drag Nodes

- Assigning Shapes: A toolbar appears at the top of the framework editor which contains Shape Tools that allow the user to change the overall shape of the current framework. Clicking on a shape button will replace the current framework with a framework of the requested shape.

  Note: Based on the rules for editing and assigning new frameworks, frameworks which are re-shaped to any shape in the toolbar other than rectangular may NOT have any shelter accesses or staking nodes. Therefore, if one of these non-rectangular shapes is selected, AutoDISE will prompt the user that all existing accesses staking nodes will be removed if they proceed.

Shapes Tools

- Adding and Editing Textboxes: See Icon Framework Textboxes for an overview of textboxes in icon frameworks. To add a new textbox to an icon framework, click the **Add Textbox** button on the toolbar at the top of the framework editor. The cursor changes to a textbox cursor. Click once on the icon framework to add a new textbox. This opens the **Textbox Editor** window. To edit a textbox, simply right-click on the desired textbox and select **Edit Textbox** from the popup menu that appears. The user can also delete a textbox by right-clicking and choosing **Delete Textbox**

- Editing Icons: AutoDISE permits icons to be edited directly in the Icon Framework Editor. To edit the icon image for the current item, click the **Edit Icon Image** button

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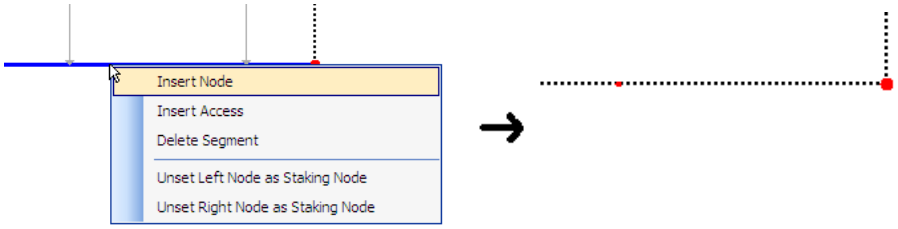
on the toolbar at the top of the framework editor. This opens the Icon Image Editor window. SeeIcon Image Edito for more information.

- Adding a node: To add a node, move the mouse over the desired wall location until the wall is highlighted, then right-click and select **Insert Node** from the menu that appears. A small red circle will be added to the wall to indicate that a node exists. The affected wall is now actually two distinct walls that can be moved independently.



Adding a Node

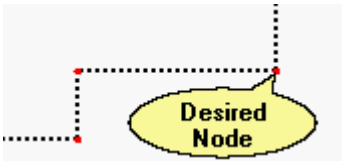
- Removing a node: Since nodes represent the joining of two perpendicular walls, nodes may not be directly removed. Rather, nodes are automatically removed when the user moves a wall to be directly in line and adjacent to another wall, essentially fusing them into one wall.

  To accomplish this, a user simply drags a wall to the point where it is perfectly inline and adjacent to a second wall. When this point is reached, the two inline walls turn a solid green color, indicating that they are ready to be fused. Releasing the mouse will join the two walls. See the images below.

Removing a Node

- Setting a staking node: ***[Note: This feature is only available for frameworks in the Icon Framework Manager, or on shelters with orthogonal frameworks]*** Staking nodes are nodes that will appear on a staking layout. To set a regular node as a staking node, move the mouse over one of the walls intersecting the desired node, right-click and select **Set [position] Node as Staking Node**, where [position] is the location of the desired node relative to the selected wall.

  For example, consider the following situation:



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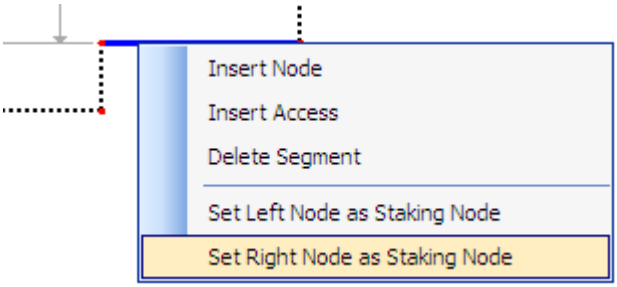
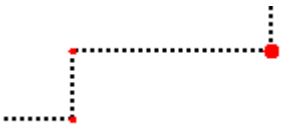
The user in this example desires the node above to be set as a staking node. The user moves the mouse over the wall immediately to the left of the node and selects **Set Right Node as Staking Node**:



The desired node is now set as a staking node:



Unsetting a staking node: ***[Note: This feature is only available for frameworks in the Icon Framework Manager, or on shelters with orthogonal frameworks]***The procedure for unsetting a staking node is identical to that for setting a staking node, except that the options available will be **Unset [position] Node as Staking Node** where [position] is the location of the desired staking node relative to the selected wall. Selecting this option will remove the node as a staking node.

Adding an access: ***[Note: This feature is only available for frameworks in the Icon Framework Manager, or on shelters with orthogonal frameworks]*** To add an access to a wall, move the mouse over the desired wall where the access will be located. Once the wall is highlighted, right-click and select **Insert Access**. This will open the **Insert Shelter Access** window:

Insert Shelter Access Window

In this window, select the passageway connector type and desired width, in inches.

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Then click **Save** or **Cancel** to exit without saving. The new access now appears on the framework

Removing an access: ***[Note: This feature is only available for frameworks in the Icon Framework Manager, or on shelters with orthogonal frameworks]*** To remove an access, right-click on the desired access and select **Delete Access** from the menu that appears.

Editing an access: ***[Note: This feature is only available for frameworks in the Icon Framework Manager, or on shelters with orthogonal frameworks]*** To edit an access, right-click on the desired access and select **Edit Access** from the menu that appears. This will open the **Edit Shelter Access** window:

Edit Shelter Access Window

In this window, select the passageway connector type and desired width, in inches. Then click **Save** or **Cancel** to exit without saving.

5.6 Rules for Editing and Assigning New Frameworks

The following rules apply when editing frameworks or assigning new frameworks to items. In most cases AutoDISE will prompt the user if a particular rule is violated and will not permit the action. In other cases, the editing features will limit the capability of the user through the editing user interface.

The following terms apply to these rules:

Staking Framework - Any icon framework that has at least one shelter access or at least one staking node.
- Any icon framework that has perimeter segments that are ALL at 90, 180, 270 or 360 degrees to the layout (framework is NOT hexagonal, octogonal, half-octogonal, decagonal or circular).

1. Staking frameworks may ONLY be assigned to shelters.
2. When editing a framework, the addition of shelter accesses and staking nodes is ONLY permitted for shelters which have orthogonal frameworks.

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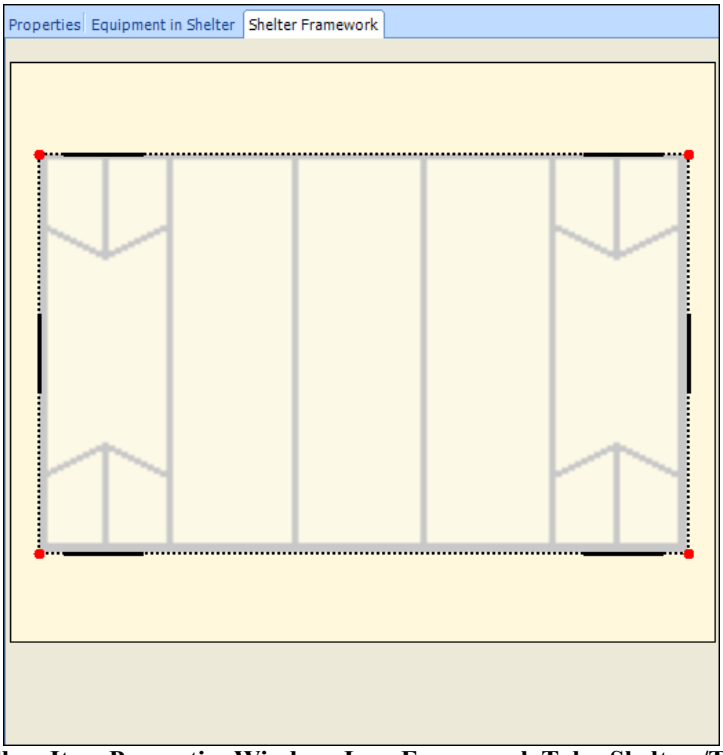
3. Frameworks may not be assigned or edited for items in shelters such that the width of the framework exceeds the width of the shelter.

5.7 Icon Framework Tab

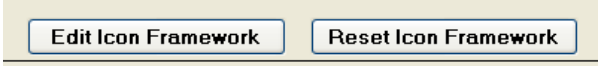
The **Icon Framework** tab exists in the **Toolbox Item Properties, Toolbox - Add New Item,** and **Layout Item Properties** windows for shelters and non-electrical items. This tab displays the icon framework assigned to the current item. Moving the mouse over walls and accesses (shelters only) on the display provides information popups about the framework.



Toolbox Item Properties Window, Icon Framework Tab - Shelters/Tents

Editing and Resetting Frameworks

Frameworks for any item other than system-defined Toolbox may be edited by clicking on the **Edit** button at the bottom of the window (not shown above), which activates the **Edit Icon Framework** and **Reset Icon Framework** buttons.



The Edit Icon Framework and Reset Icon Framework Buttons

Clicking the **Edit Icon Framework** button opens the Edit Icon Framework window, allowing the user to modify the framework. See Editing an Icon Framework.

Clicking on the **Reset Icon Framework** button will reset the icon framework to a rectangular framework, void of any shelter accesses or shelter staking nodes (shelters only).

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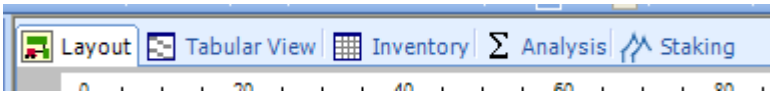
Part VI

6 Layout View Options

AutoDISE provides four distinct methods for viewing information about an AutoDISE layout:



1. **Main Layout View** - The Layout is the graphical representation of the layout where the user can see a top-down view of the layout, items on the layout and links, as well as other graphical features such as textboxes.

2. **Tabular View** - The Tabular View contains a listing of all electrical equipment on the layout in table format which also permits easy manipulation of links and item connections.

3. **Inventory** - The Inventory section displays a filterable, sortable listing of equipment. Provides the ability to set up multiple inventory views with varying filters and sorting to permit side-by-side comparison of inventories.

4. **Analysis** - The Analysis section provides statistics on power distribution and phase balancing, including a Layout Power Summary.tab for the entire layout, a tab for analyzing unconnected loads, and a Generator Load Summary tab for each generator or set of paralleled generators on the layout.

5. **Staking** - The Staking view provides tools for designing a DEPMEDS staking layout. See Staking for more information.

6.1 Main Layout View

The Main Layout View is the graphical representation of the layout where the user can see a top-down view of the layout, items on the layout and links, as well as other graphical features such as textboxes and callouts.

The Main Layout View has several properties that affect how the view appears. These properties can be modified in the Layout Properties window.

See also Parts of the AutoDISE Screen

6.1.1 Layout Properties

Layout Properties affect the behavior and appearance of both the main layout and shelter layouts.

Layout Properties may be viewed and modified by selecting **Layout Properties** in the Layout Menu or clicking on the **Layout Properties** button on the Main Toolbar. This opens the

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Layout Properties window.

See the Layout Properties window for a detailed description of layout properties.

6.1.2 Setting Zoom for the Main Layout

The user may zoom in and out of the main layout using one of five zoom features:

1. Click on either the **Zoom In** or **Zoom Out** buttons on the Main Toolbar. The cursor will change into the respective zoom cursor, then click anywhere on the layout to activate the zoom. The zoom will change by the percent set in the Layout Properties window.

2. Select the exact percent zoom desired by selecting **Zoom** from the View Menu.

3. Click on the **Zoom In On Selected Area** button on the Main Toolbar. The cursor will turn into a Zoom Area cursor and the user can click and drag on the main layout to select an area to zoom in on.

4. Click on the **Zoom Main Layout to Fit Screen** button on the Main Toolbar. AutoDISE will automatically calculate the layout size necessary to fit all layout items in view, NOT including Shelter Windows.

6.1.3 Rotating Icons

All item icons on a layout may be rotated.

Rotate an icon by right-clicking on the icon and selecting **Rotate** from the popup menu that appears. A submenu will appear with the following options:

- **Reset Icon Rotation** - Returns icon rotation to zero degrees
- **90 Degrees** - Rotates icon 90 degrees clockwise relative to its current rotation
- **180 Degrees** - Rotates icon 180 degrees clockwise relative to its current rotation
- **270 Degrees** - Rotates icon 270 degrees clockwise relative to its current rotation
- **Custom** - opens up a **Rotate Custom** window which allows the user to enter the desired rotation in degrees or click the **Reset** button to return icon rotation to zero degrees.

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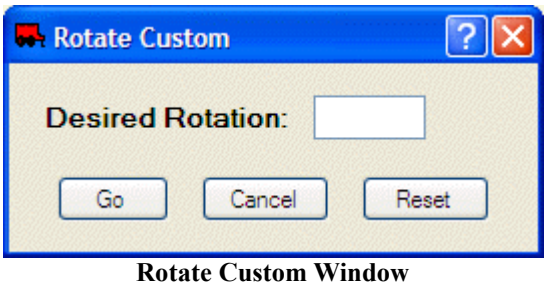

Rotate Custom Window

***Note*: Shelters with *frameworks* assigned may only be rotated in increments of 90 degrees to support 90 degree connections between shelters and *passageways*. In this case the custom rotate options will be disabled.**

6.2 Tabular View

The **Tabular View** contains a listing of all electrical equipment on the layout in table format which also permits easy manipulation of links and item connections.

There is a **left** and **right** side. The **left** side is the primary view and contains all layout items. The **right** side, however, shows only the node which is currently selected on the **left** side. This functionality is similar to Windows Explorer, where the right side of window shows the contents of the folder selected on the left side.

The tabular format utilized by the **Tabular View** behaves like the tree structure employed by Windows Explorer. Information is grouped into "Nodes", which in turn have child nodes and so on, forming a tree structure. A node can represent an item, such as a generator or consumer, an output connection of a distribution item, or either the parent node of all "**Unconnected Distribution**" or the parent node of all "**Unconnected Consumers**".

The "root" nodes, or primary nodes, contain one node for each generator or group of paralleled generators on the layout, as well as the "**Unconnected Distribution**" parent node if any unconnected distribution exist and/or the "**Unconnected Consumers**" parent node if any unconnected consumers exist.

The figure below shows the **Tabular View** with one generator root node and the "**Unconnected Consumers**" parent node, both of which are expanded to show their respective child nodes.

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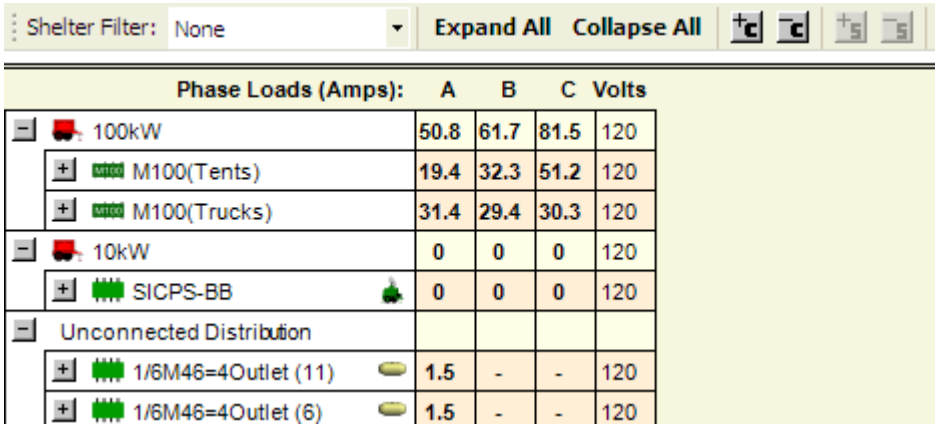
Shelter Filter: None
Expand All
Collapse All
Phase Loads (Amps): A B C Volts
100kW 50.8 61.7 81.5 120
M100(Tents) 19.4 32.3 51.2 120
M100(Trucks) 31.4 29.4 30.3 120
10kW 0 0 0 120
SICPS-BB 0 0 0 120
Unconnected Distribution
1/6M46=4Outlet (11) 1.5 - - 120
1/6M46=4Outlet (6) 1.5 - - 120

Sample Tabular View

Phase loads and voltages are shown to the right of each node and are in Amps. Colors are used to help distinguish the different node tiers within the tree. Phase loads shown in red indicate that at least one connection on the item is overloaded..

Nodes may be dragged and dropped to adjust links within the layout. Using the Tabular View is oftentimes much easier than using the Main Layout View since one drag and drop operation achieves the same result as having to manually delete a link then manually link two items on the Main Layout View.

See also: Expanding/Collapsing Nodes, Filtering Nodes, Dragging and Dropping Nodes, Right-click Options, Consumer Chains Icon, Phase Rotation Icon, Shelter Icon

6.2.1 Expanding/Collapsing Nodes

Each line in the **Tabular View** is called a node.

If a particular node has sub-nodes, or "child nodes", a ⊞ or ⊟ button will appear at the left end of the node.

A ⊞ denotes that the node is collapsed and all child nodes are hidden. Clicking the ⊞ expands all child nodes so they are now visible.

A ⊟ denotes that this node has been expanded and all child nodes are now visible. Clicking the ⊟ will collapse the node and hide all child nodes.

6.2.2 Filtering Nodes

The header below exists at the top of the Tabular View:

This options in this header are used to filter the nodes so the user can quickly find the equipment they want to see. The filtering options are:

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- Filter by shelter
- Expand/collapse all node trees
- Show/hide all Unconnected Connections ( )
- Show/hide Items Not on Shelter Path. ( )

6.2.2.1 Filter by Shelter

The **Filter by Shelter** option will mask all equipment nodes NOT inside the selected shelter with gray, leaving all item nodes inside the shelter with a white background.

The filter does ***NOT*** remove items from the **Tabular View**, but simply makes it more visibly obvious which items on the view are in the selected shelter.

6.2.2.2 Show/Hide Unconnected Connections

The buttons below appear in the header of the Tabular View and can also exist on individual nodes.

If the button which is clicked is on the header, it affects ALL nodes in the tree. If the button which is clicked is on an individual node, it only affects the child nodes for that item.

- Shows nodes which are nodes that contain a distribution equipment output connection which is currently not connected to another item.

- Hides nodes which are nodes that contain a distribution equipment output connection which is currently not connected to another item.

6.2.2.3 Show/Hide Items Not in Shelter Path

The buttons below appear in the header of the Tabular View and can also exist on individual nodes.

If the button which is clicked is on the header, it affects ALL nodes in the tree. If the button which is clicked is on an individual node, it only affects the child nodes for that item.

Shelter Path is defined as the direct path from a generator to an item located inside a shelter. An item which is **on a shelter path** is defined as an item which lies on at least one direct path between a generator and any item within a shelter.

The purpose of showing and hiding items not on a shelter path is to filter out all items which have do not provide any information about how items within a shelter are connected to a generator.

- Shows nodes of all items which are NOT on a shelter path.

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- Hides nodes of all items which are NOT on a shelter path

6.2.3 Dragging and Dropping Nodes

Clicking and dragging a node allows the user to create or modify links on a layout.

Some nodes, such as those for generators, may not be dragged. If a node may be dragged, the cursor will change to show that the node is being dragged. As the user drags a node, acceptable node targets will be highlighted in green as the user drags over that node. To link or re-link the dragged item, simply release the drag over an acceptable target node and AutoDISE will automatically delete any previous links to the dragged item and re-link it to the target item.

In addition, items may be dragged to and from the right side of the Tabular View.

Consumer Chains

Consumer Chains may be dragged as a unit by clicking and dragging the corresponding Consumer Chain Icon.

Single phase consumers may be chained and unchained using the Tabular View. Too add a consumer to a chain or start a chain, simply drag the consumer to another and a dark line will appear above or below the target consumer. Release and the dragged consumer will be chained to the target consumer. In the figure below, a single phase consumer is being dragged to below the "10A, 1-Ph" consumer. If the mouse is release, the dragged consumer will be chained to the "10A, 1-Ph" consumer directly below it.

Dragging Single Phase Consumer to Another To Chain

6.2.4 Right-click Options

If the user right-clicks on a Tabular View node, a limited number of right-click options appear. The options which appear depend on the node you are clicking on.

The options which appear are all discussed in the right-click options for the various item types:

- Common right-click options
- Generator right-click options
- Consumer right-click options
- Distribution item right-click options

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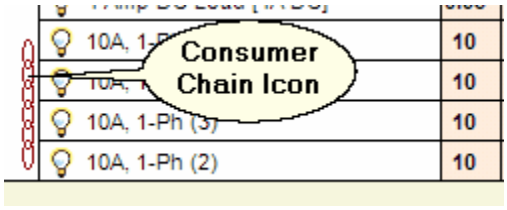
There is one option that is unique to the Tabular View. If the user right-clicks on a node for a distribution item connection, an option will appear allowing the user to add/insert a receptacle ("**add receptacle**" if connection is unconnected and "**insert receptacle**" if connection is connected).

6.2.5 Consumer Chains Icon

Consumer Chains are represented on the Tabular View by a **Consumer Chain Icon**:



Consumer Chain Icon

Consumer chain icons may be dragged and dropped onto valid target nodes, which will effectively re-link the entire chain as a unit to a new connection.

6.2.6 Phase Rotation Icon

To ensure all phase loads add up properly in their respective columns in the Tabular View, all phase loads shown in this view are "generator phase loads", which may or may not be the same as the "local phase loads". This would be due to phase rotation, either at the generator or by a universal adapter. See phase rotation for more information.

In cases where the phases are rotated, the **Phase Rotation Icon** is displayed at the right end of the respective node. When the mouse is hovered over this icon, a balloon will display what the rotation is, and the "local phase loads" of that item.

Phase Loads (Amps):	A	B	C
100kW	0	20	0
80 3 input	0	20	0
O-4	0	0	0
O-5	-	-	0
O-6	0	-	-
O-7	-	20	-
10A, 1-Ph (1)	-	10	-
10A, 1-Ph	-	-	10
O-8	-	-	0

Tabular View Showing Phase Rotation Icon

6.2.7 Shelter Icon

If a an item is located within a shelter, an icon of that shelter will be displayed on the right side of the node for that item in Tabular View.

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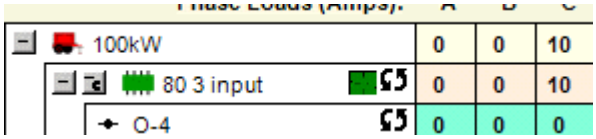

Tabular View Showing a Shelter Icon

6.3 Inventory View

Inventory View provides a tabular listing of items in a layout.

Multiple inventory views may be generated by clicking on the **Add New Inventory View** button at the top of the Inventory View window. See Working with Multiple Inventory Views.

Inventory views may be filtered for content and sorted. See Filtering an Inventory View and Sorting an Inventory View.

Inventory views may be printed or exported. To print an inventory view, click on **Print** on the desired inventory view, or select **Print Inventory** from the File Menu. To export an inventory view, click on **Export** on the desired inventory view, or select **Export Inventory** from the File Menu. See Print Inventory and Export Inventory.

Add New Inventory View

Inventory View 1

Filter: Show All EXCEPT: Shelter, SICPS, Universal Adapter and Hide all non-Toolbox Cables

Location - Show Items in Main Layout

Edit Filter Print Export (Click on column headers to sort)

Type	Name	Quantity	Rating, kW	Rating, A per Ø	Rating, Volts	# Ø	Location	Generator
Generator	100kW	1	100.01	277.8	120/208	3	Main Layout	100kW
Generator	10kW	1	10.01	27.8	120/208	3	Main Layout	10kW
DISE	M100(Trucks)	1	36	100	120	3	Main Layout	100kW
DISE	M40	1	14.4	40	120	3	Main Layout	100kW
DISE	M40 (1)	1	14.4	40	120	3	Main Layout	100kW
DISE	M100(Tents)	1	36	100	120	3	Main Layout	100kW
Cable	Extension	11	-	20	-	1	Main Layout	-
Cable	Extension	6	-	20	-	1	Main Layout	-

Sample Inventory View

6.3.1 Filtering an Inventory View

To edit the filter of an inventory view, click the **Edit Filter** button near the top of the inventory view. The **Edit Inventory Filter** window opens.

The **Edit Filter** window allows you to specify the **Equipment Types to Show**, **Locations to Show** and **Fields to Show** in the inventory view.

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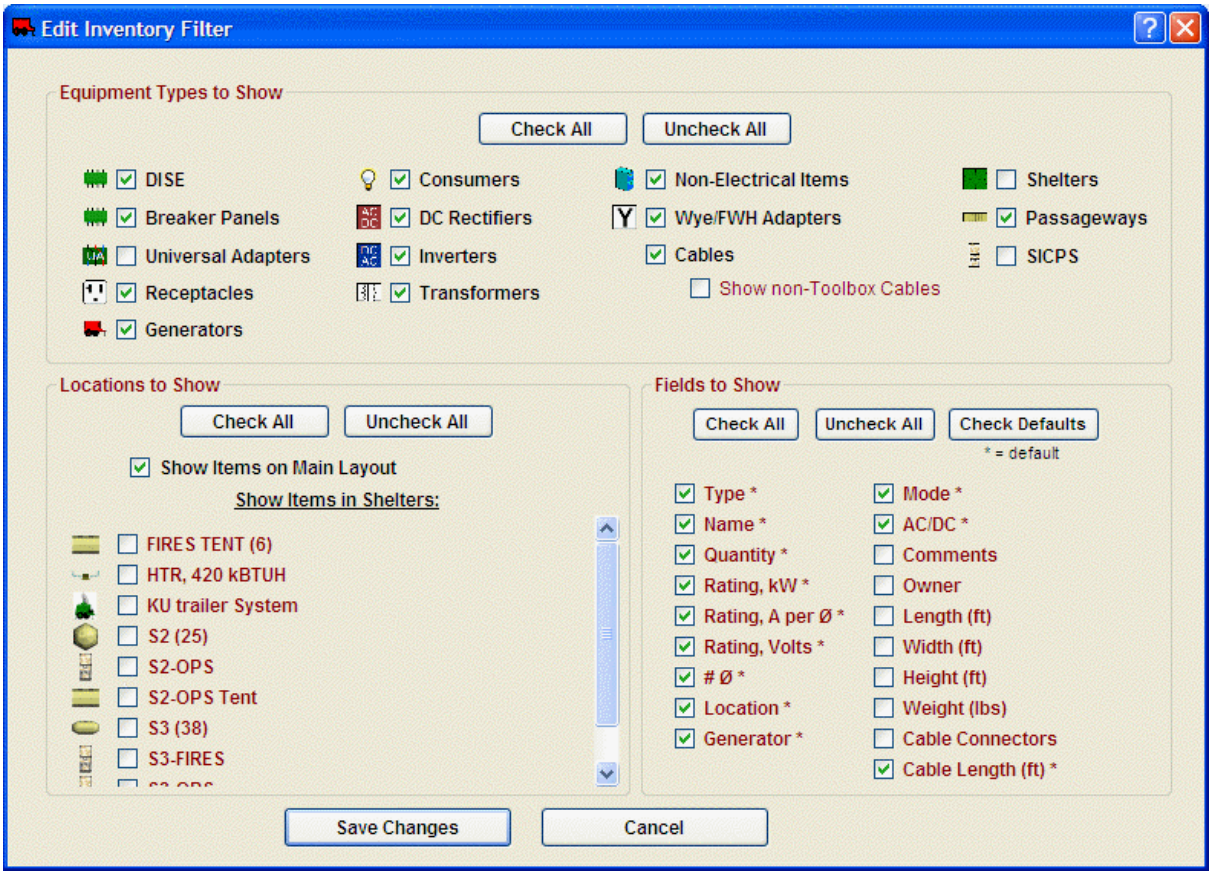
In **Equipment Types to Show** there is an option to **Show non-Toolbox Cables**. See the note in Suggested Cables for a Link for an explanation of non-Toolbox cables.

In **Fields to Show** note that a subset of the fields are denoted as "**default**" fields. These fields are the fields that are initially checked when an inventory is created.

***Note**: The "Location" field specifies whether the item is on the main layout or in one of the shelter layouts. For links that cross layouts, the location of the cables which comprise that link are defined by the location of the item connected on the end of the link CLOSEST to the power source.*



Edit Inventory Filter Window

6.3.2 Sorting an Inventory View

To sort rows in an inventory view by column field, click on the desired field name in the inventory view header. Subsequent clicks on the same field in the header will toggle the sort direction between ascending and descending order.

6.3.3 Working with Multiple Inventory Views

Multiple inventory views may be generated at the same time, each with its own filter and sort. By default, these views are displayed as side-by-side views.

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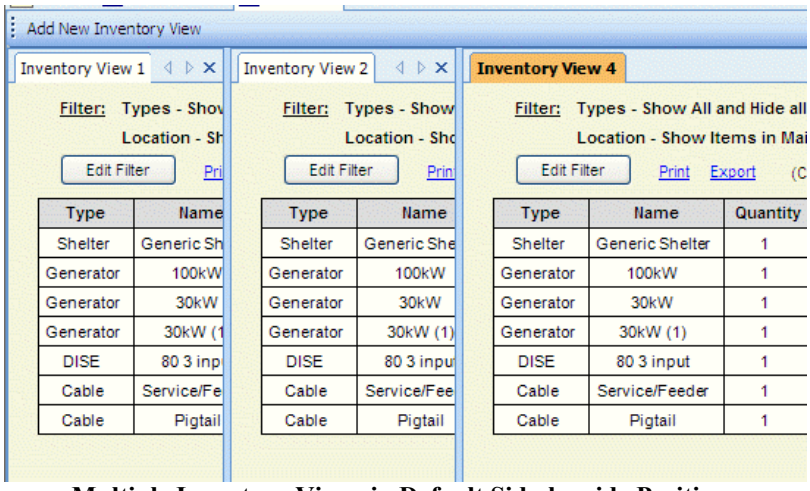
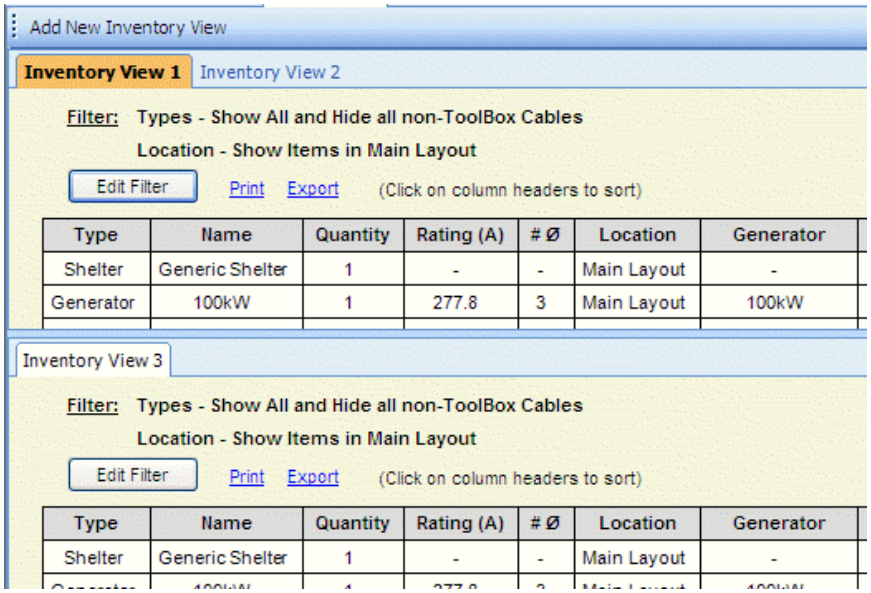


Multiple Inventory Views in Default Side-by-side Positions

The user, however, is not limited to this side-by-side view. These individual views may be dragged and repositioned by clicking and dragging the tab headers. During the drag operation, indicators will appear which allow a multitude of repositioning options. In the figure below, Inventory View 1 and 2 have been layered on top of one another and Inventory View 3 has been repositioned below 1 and 2. The user should experiment to fully understand the variety of repositioning options.



Multiple Inventory Views in Repositioned State

6.4 Analysis View

The **Analysis View** section provides statistics on power distribution and phase balancing, including a Layout Power Summary of the entire layout, a section for analyzing unpowered loads, and a Generator Load Summary for each generator or set of paralleled generators on the layout.

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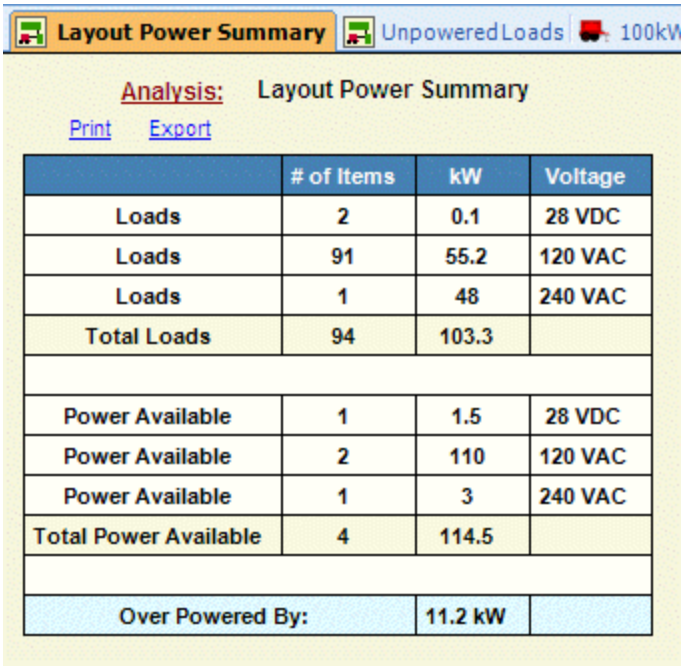
Analysis views may be printed or exported. To print an analysis view, click on **Print** on the desired analysis view, or select **Print Analysis** from the File Menu. To export an analysis view, click on **Export** on the desired analysis view, or select **Export Analysis** from the File Menu. See Print Analysis and Export Analysis.



	# of Items	kW	Voltage
Loads	2	0.1	28 VDC
Loads	91	55.2	120 VAC
Loads	1	48	240 VAC
Total Loads	94	103.3	
Power Available	1	1.5	28 VDC
Power Available	2	110	120 VAC
Power Available	1	3	240 VAC
Total Power Available	4	114.5	
Over Powered By:		11.2 kW	

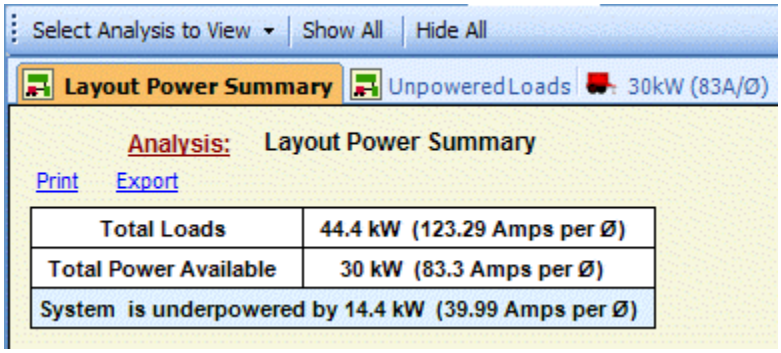
Analysis View

See Layout Power Summary, Unpowered Loads and Generator Load Summary and Statistics.

6.4.1 Layout Power Summary

The **Layout Power Summary** shows the **Total Loads** of the entire layout, the **Total Power Available** for the entire layout and the difference between them. **Total Loads** is the sum of all electrical consumer loads in the layout. This includes all the electrical consumers in shelters. The **Total Power Available** is the rated power sum of all the generators on the layout.

Note: If a power factor of 0.8 is assumed for all generators (see Options), then all generator power will be displayed in kVA rather than kW.



Total Loads	44.4 kW (123.29 Amps per Ø)
Total Power Available	30 kW (83.3 Amps per Ø)
System is underpowered by 14.4 kW (39.99 Amps per Ø)	

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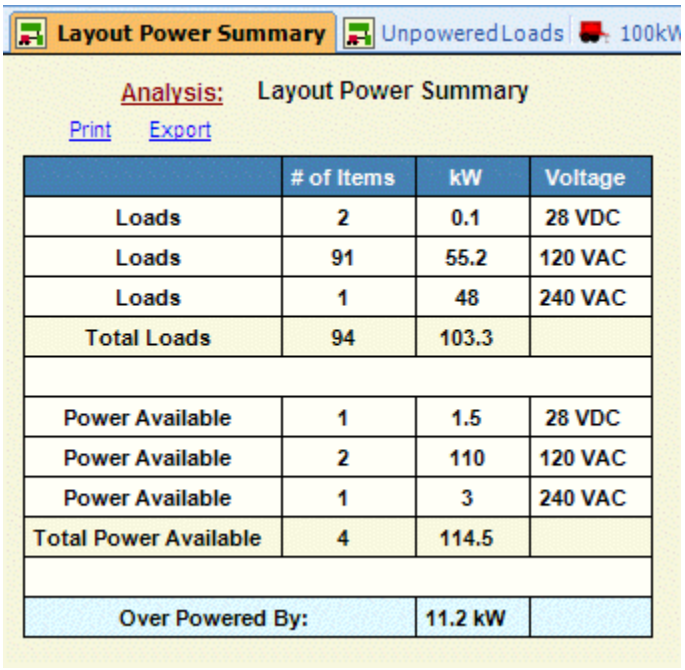
Layout Power Summary

If multiple voltages are represented on a layout, the Layout Power Summary data is broken down by the different voltages. See the image below for an example where two AC and one DC voltage is represented on a layout.



Layout Power Summary | Unpowered Loads | 100kW

Analysis: Layout Power Summary

Print Export

	# of Items	kW	Voltage
Loads	2	0.1	28 VDC
Loads	91	55.2	120 VAC
Loads	1	48	240 VAC
Total Loads	94	103.3	
Power Available	1	1.5	28 VDC
Power Available	2	110	120 VAC
Power Available	1	3	240 VAC
Total Power Available	4	114.5	
Over Powered By:		11.2 kW	

Layout Power Summary with Multiple Voltages

6.4.2 Unpowered Loads

Unpowered loads show all the electrical consumers on the layout which are not powered by a generator. It includes statistics pertaining to the unpowered loads as well as recommending a generator.

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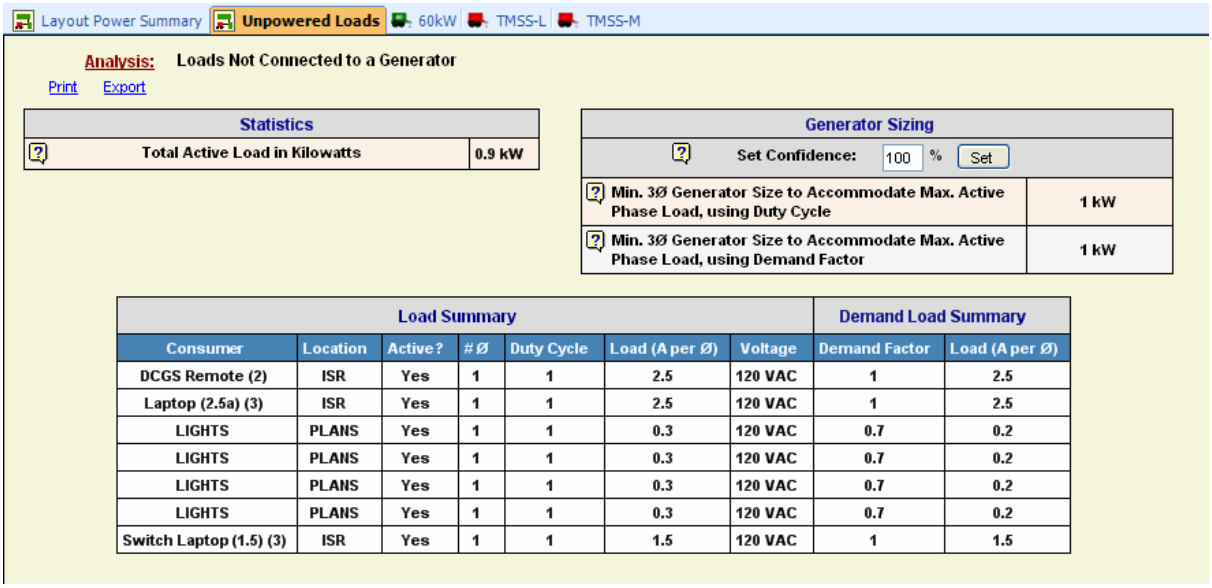
Layout Power Summary
Unpowered Loads
60kW
TMSS-L
TMSS-M
Analysis: Loads Not Connected to a Generator
Print
Export
Statistics
Total Active Load in Kilowatts
0.9 kW
Generator Sizing
Set Confidence: 100 % Set
Min. 3Ø Generator Size to Accommodate Max. Active Phase Load, using Duty Cycle
1 kW
Min. 3Ø Generator Size to Accommodate Max. Active Phase Load, using Demand Factor
1 kW
Load Summary
Demand Load Summary
Consumer | Location | Active? | # Ø | Duty Cycle | Load (A per Ø) | Voltage | Demand Factor | Load (A per Ø)
DCGS Remote (2) | ISR | Yes | 1 | 1 | 2.5 | 120 VAC | 1 | 2.5
Laptop (2.5a) (3) | ISR | Yes | 1 | 1 | 2.5 | 120 VAC | 1 | 2.5
LIGHTS | PLANS | Yes | 1 | 1 | 0.3 | 120 VAC | 0.7 | 0.2
LIGHTS | PLANS | Yes | 1 | 1 | 0.3 | 120 VAC | 0.7 | 0.2
LIGHTS | PLANS | Yes | 1 | 1 | 0.3 | 120 VAC | 0.7 | 0.2
LIGHTS | PLANS | Yes | 1 | 1 | 0.3 | 120 VAC | 0.7 | 0.2
Switch Laptop (1.5) (3) | ISR | Yes | 1 | 1 | 1.5 | 120 VAC | 1 | 1.5

Unpowered Loads

The following information is provided in this section:

1. **Load Summary** of all unconnected loads.

2. **Loads, with Demand Factor**: For loads inside shelters, the demand factor for that shelter is provided, along with the calculated load with demand factor included.

3. **Total Load in kW:** The sum of the total Amps per phase required to power all connected loads multiplied times 120V (converted to kW).

4. **Confidence**: The percentage of time a generator would provide sufficient power to the loads, if a generator were connected.

5. **Minimum 3 Phases Generator Size to Accommodate Maximum Phase Load, using Duty Cycle**: Minimum 3-phase generator size required to prevent any one phase from exceeding its rated amperage capacity, including consumer duty cycles when determining consumer loads.

6. **Minimum 3 Phases Generator Size to Accommodate Maximum Phase Load, using Demand Factor**: Minimum 3-phase generator size required to prevent any one phase from exceeding its rated amperage capacity, including shelter and layout demand factors when determining consumer loads.

6.4.3 Generator Load Summary and Statistics

The **Generator Load Summary and Statistics** section provides statistics and load summary information about a single generator or group of paralleled generators.

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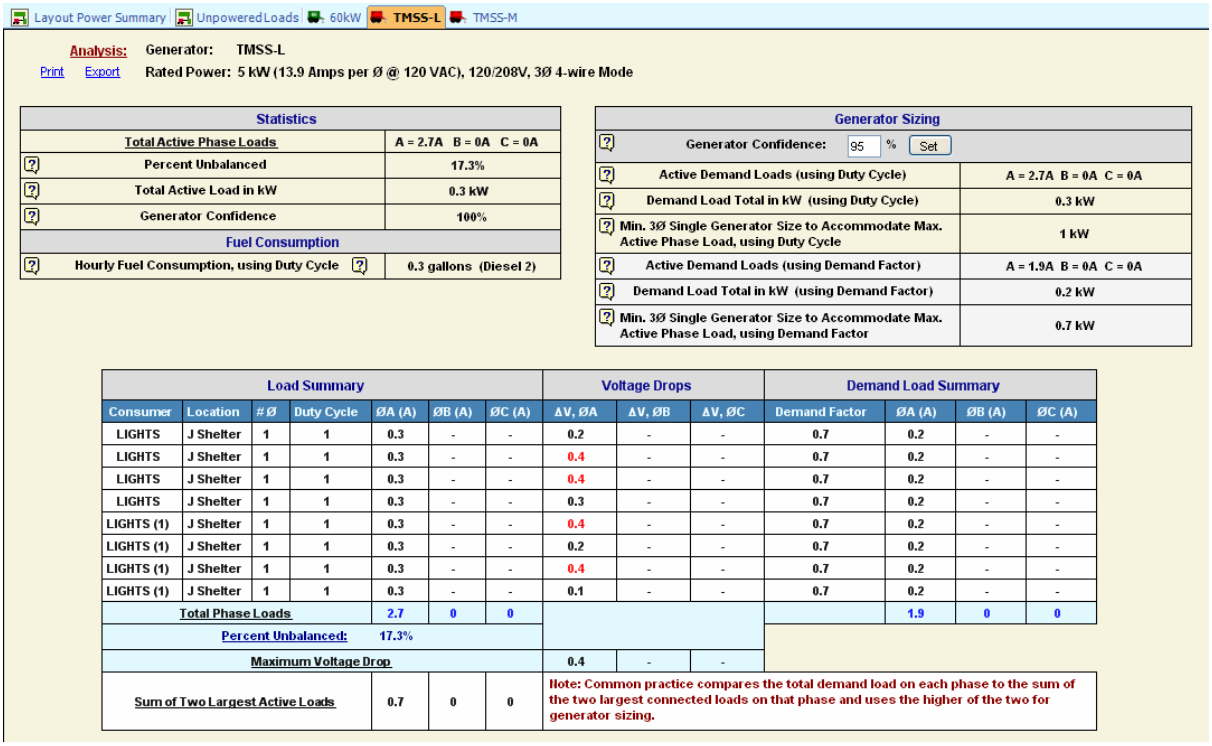

Layout Power Summary | Unpowered Loads | 60kW | TMSS-L | TMSS-M

Analysis: Generator: TMSS-L

Print Export Rated Power: 5 kW (13.9 Amps per Ø @ 120 VAC), 120/208V, 3Ø 4-wire Mode

Statistics	
Total Active Phase Loads	A = 2.7A B = 0A C = 0A
Percent Unbalanced	17.3%
Total Active Load in kW	0.3 kW
Generator Confidence	100%
Fuel Consumption	
Hourly Fuel Consumption, using Duty Cycle	0.3 gallons (Diesel 2)

Generator Sizing	
Generator Confidence: 95 % Set	
Active Demand Loads (using Duty Cycle)	A = 2.7A B = 0A C = 0A
Demand Load Total in kW (using Duty Cycle)	0.3 kW
Min. 3Ø Single Generator Size to Accommodate Max. Active Phase Load, using Duty Cycle	1 kW
Active Demand Loads (using Demand Factor)	A = 1.9A B = 0A C = 0A
Demand Load Total in kW (using Demand Factor)	0.2 kW
Min. 3Ø Single Generator Size to Accommodate Max. Active Phase Load, using Demand Factor	0.7 kW

Load Summary							Voltage Drops			Demand Load Summary			
Consumer	Location	# Ø	Duty Cycle	ØA (A)	ØB (A)	ØC (A)	ΔV, ØA	ΔV, ØB	ΔV, ØC	Demand Factor	ØA (A)	ØB (A)	ØC (A)
LIGHTS	J Shelter	1	1	0.3	-	-	0.2	-	-	0.7	0.2	-	-
LIGHTS	J Shelter	1	1	0.3	-	-	0.4	-	-	0.7	0.2	-	-
LIGHTS	J Shelter	1	1	0.3	-	-	0.4	-	-	0.7	0.2	-	-
LIGHTS	J Shelter	1	1	0.3	-	-	0.3	-	-	0.7	0.2	-	-
LIGHTS (1)	J Shelter	1	1	0.3	-	-	0.4	-	-	0.7	0.2	-	-
LIGHTS (1)	J Shelter	1	1	0.3	-	-	0.2	-	-	0.7	0.2	-	-
LIGHTS (1)	J Shelter	1	1	0.3	-	-	0.4	-	-	0.7	0.2	-	-
LIGHTS (1)	J Shelter	1	1	0.3	-	-	0.1	-	-	0.7	0.2	-	-
Total Phase Loads				2.7	0	0					1.9	0	0
Percent Unbalanced:				17.3%									
Maximum Voltage Drop							0.4	-	-				
Sum of Two Largest Active Loads				0.7	0	0	Note: Common practice compares the total demand load on each phase to the sum of the two largest connected loads on that phase and uses the higher of the two for generator sizing.						

Generator Load Summary and Statistics

The following information is provided in this section:

1. **Load Summary** of all loads connected to the generator, broken out by phase.

2. Voltage Drop from each load to the generator for each phase.

3. **Loads, with Demand Factor**: For loads inside shelters, the demand factor for that shelter is provided, along with the calculated phase load with demand factor included.

4. **Total Phase Load** for each generator phase

5. **Maximum** Voltage Drop from any load to the generator for each phase.

6. **Percent Unbalanced:** The maximum phase amperage minus the minimum phase amperage divided by the generator amperage rating per phase.

7. **Total Load in kW:** The sum of the total Amps per phase required to power all connected loads multiplied times 120V (converted to kW).

   Note: If a power factor of 0.8 is assumed for all generators (see Options), then all generator power will be displayed in kVA rather than kW.

8. **Generator Confidence**: Given the stated consumer duty cycles, the percentage of time the generator will provide sufficient power to the connected loads.. (Based on binomial distribution and duty cycles)

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9. **Generator Design Efficiency**: Rated efficiency of generator (between 5% and 45%)

10. **Hourly Fuel Consumption**: Gallons of diesel fuel consumption per hour. This calculation is dependent on the generator performance curve and whether the user has selected fuel consumption to be calculated based determining consumer loads from duty cycles and generator efficiency, or from demand factors. (See Appendix A for detailed explanation)

11. **Generator Confidence**: For generator sizing, confidence is the minimum acceptable percentage of time one can be assured that all loads are sufficiently powered.

12. **Active Demand Loads (using Duty Cycle)**: The maximum predicted load on a phase of the generator at a specified confidence level (based on binomial distribution and duty cycles).

13. **Demand Load Total in kW (using Duty Cycle)**: The sum of the active demand loads (using duty cycle) multiplied times 120V (converted to kW).

    Note: If a power factor of 0.8 is assumed for all generators (see Options), then the demand load total will be displayed in kVA rather than kW.

14. **Minimum 3 Phases Generator Size to Accommodate Maximum Phase Load, using Duty Cycle**: Minimum 3-phase generator size required to prevent any one phase from exceeding its rated amperage capacity, including consumer duty cycles when determining consumer loads.

15. **Active Demand Loads (using Demand Factor)**: The maximum predicted load on a phase of the generator, including demand factors in determining consumer loads.

16. **Demand Load Total in kW (using Demand Factor)**: The sum of the active demand loads (using demand factors) multiplied times 120V (converted to kW).

    Note: If a power factor of 0.8 is assumed for all generators (see Options), then the demand load total will be displayed in kVA rather than kW.

17. **Minimum 3 Phases Generator Size to Accommodate Maximum Phase Load, using Demand Factor**: Minimum 3-phase generator size required to prevent any one phase from exceeding its rated amperage capacity, including demand factors when determining consumer loads

6.5 Staking View

The **Staking View** provides tools for designing a DEPMEDS staking layout. See Staking for more information.

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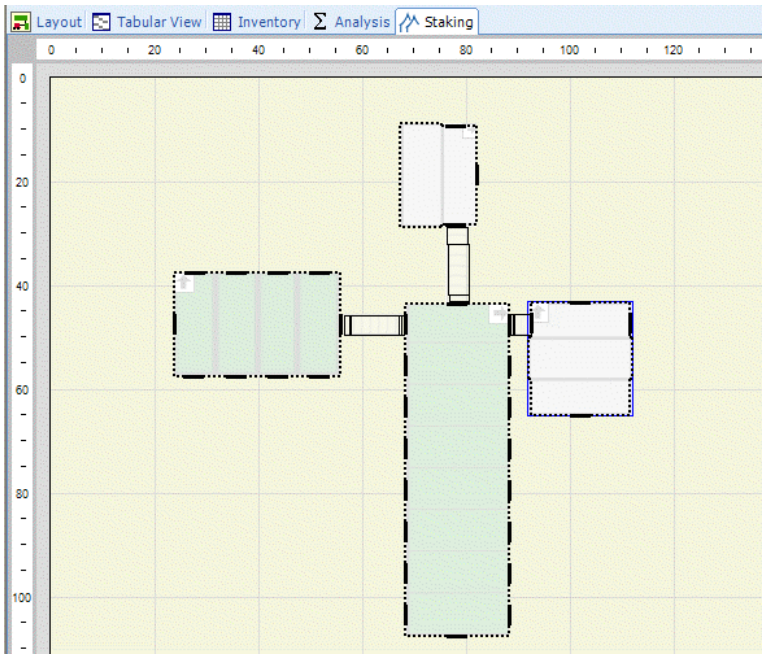

A Staking Layout with Frameworks Visible

The **Staking View** has several Staking View Options which may be modified by clicking on the **Staking View Options** button on the Main Toolbar and editing the Staking View Options window.

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Part VII

7 Shelter Windows

Shelter Window are sub-windows embedded in an AutoDISE layout which allow a user to view and modify the internal items and links within a shelter.

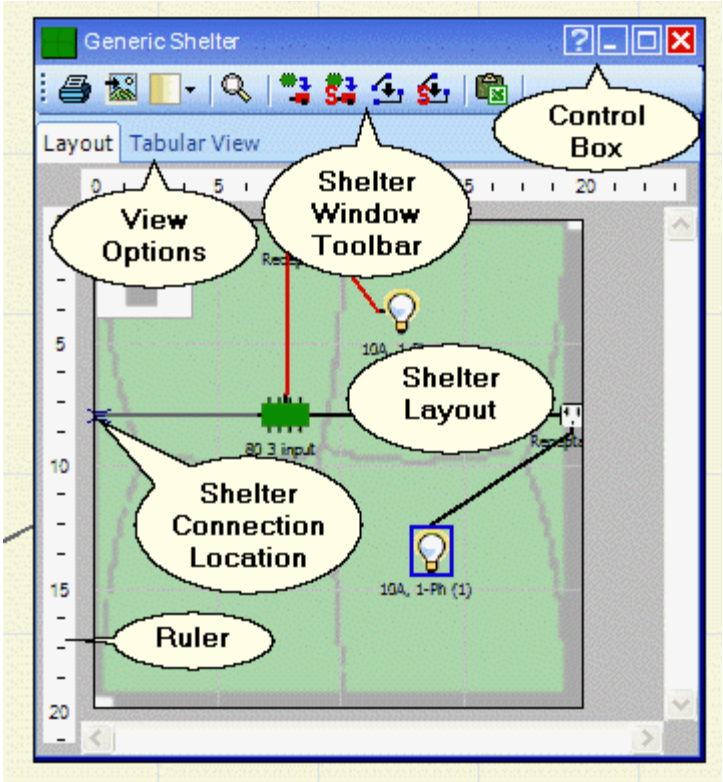
***Note*: Shelter windows are NOT visible in the *Staking View*, only the *Main Layout View*.**

To open a Shelter Window for a particular shelter, either double-click on that shelter on the main layout, or right-click on that shelter and select **Open Shelter Layout** from the popup menu that appears.

Shelter Windows look similar to the Main Layout View. However, there are some notable differences. The Shelter Window Toolbar has fewer options and the only two views provided are the Layout and Tabular views.

The background of the Shelter Window is identical to the icon used for that shelter on the main layout. This image is intentionally lightened to make it easier to view the layout contents. The opacity of this background image can be modified using the **Background Image Opacity** slider on the Shelter Window Toolbar.

See Parts of a Shelter Window for a complete description of Shelter Window components.



Sample Shelter Window

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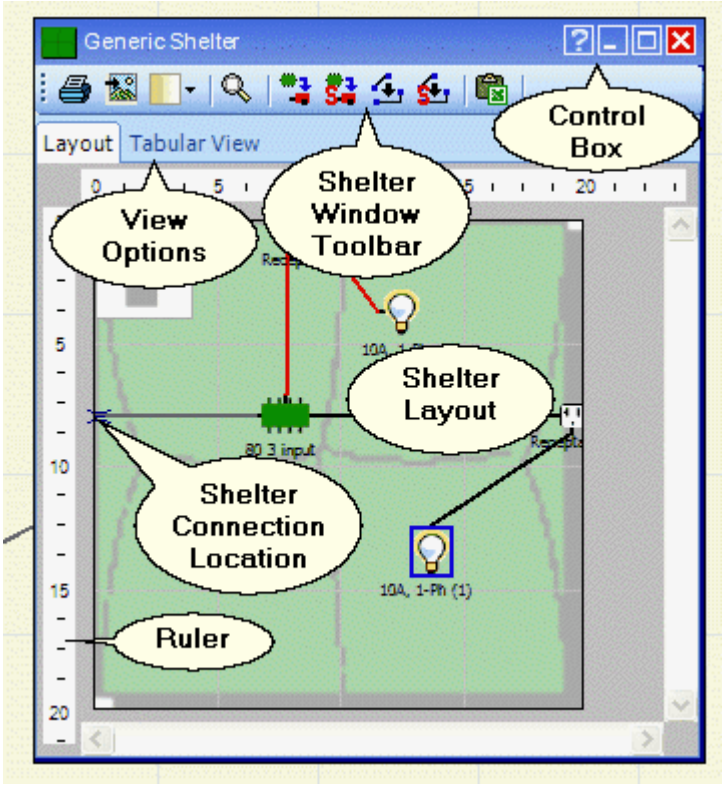
See also: Opening a Shelter Window, Resizing a Shelter Window, Moving a Shelter Window, Adding Equipment to a Shelter, Shelter Layout View, Shelter Tabular View

7.1 Parts of a Shelter Window

The parts of a Shelter Window are shown below:



Parts of a Shelter Window

- **Control Box** - contains buttons to manage overall window features:

  - Activates help file and opens to Shelter Windows section
  - Minimizes Shelter Window. If minimized, button returns window to pre-minimized dimensions
  - Fits window to layout. This resizes the Shelter Window to fit the size of the shelter layout
  - Closes the Shelter Window

- **Shelter Window Toolbar** - contains buttons for printing, exporting, changing background image opacity, zoom to fit layout in window, AutoConnect, AutoRoute and add consumers by tabular format from Microsoft Excel or the Toolbox

- **View Options** - Layout View and Tabular View

- **Shelter Layout** - graphical layout where items and links are drawn

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- **Rulers -** identical to rulers in Main Layout View
- **Shelter Connection Locations -** The points along a shelter perimeter where a link between an item in the shelter and an item not in the shelter will penetrate.

7.2 Opening a Shelter Window

To open a Shelter Window for a particular shelter, either double-click on that shelter on the main layout, or right-click on that shelter and select **Open Shelter Layout** from the popup menu that appears.

7.3 Resizing a Shelter Window

A shelter window initially opens sized proportional to the shelter dimensions.

The user may resize a Shelter Window by moving the mouse to either the right edge, bottom edge or bottom-right corner of the window and clicking and dragging.

7.4 Setting Zoom for a Shelter Window

The user may zoom in and out of a shelter layout using one of three zoom features:

1. Click on either the **Zoom In** or **Zoom Out** buttons on the Main Toolbar. The cursor will change into the respective zoom cursor, then click anywhere on the shelter layout to activate the zoom. The zoom will change by the percent set in the Layout Properties window.

2. Click on the **Zoom In On Selected Area** button on the Main Toolbar. The cursor will turn into a **Zoom Area** cursor and the user can click and drag on the shelter layout to select an area to zoom in on.

3. Click on the **Zoom to Fit Layout to Window** button on the Shelter Window Toolbar. AutoDISE will calculate the zoom necessary to perfectly fit the shelter layout to fit inside the parent Shelter Window.

7.5 Moving a Shelter Window

To move a shelter window, click and drag the top header of the window, similar to what is required for windows in Microsoft Windows.

7.6 Adding Equipment to a Shelter

To add equipment to a shelter, the user must open the Shelter Window for that shelter and add items to the shelter layout.

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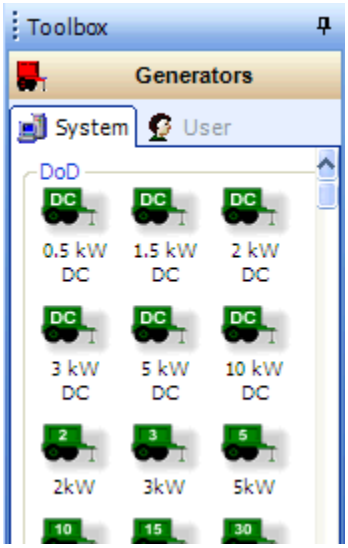
Users can select a particular piece of equipment from the Toolbox and add it to a shelter layout. There are three ways to accomplish this.

Graphical methods

1. Click on the **Add Item to Layout** button located on the Main Toolbar, or select **Add Item to Layout** from the Layout Menu. See the Add Items From Toolbox window for further instructions

2. Open the Toolbox by clicking on the Toolbox on the left side of the screen. Click on the desired item then move your mouse to the desired shelter layout.



The Toolbox

Once the user has selected a piece of equipment to add to the shelter layout, the cursor will change to an image representing the generic type of that equipment. The user can then add as many pieces of that equipment type to the layout as desired by clicking the cursor on the desired location within the layout. Once the user is finished adding that item to the layout, right-click to return to normal mode or click on the **Normal Mode** button on the Main Toolbar.

Non-graphical method for Consumers

3. Oftentimes, layout designers have shelter layout consumer data in a Microsoft Excel spreadsheet. AutoDISE provides a method for adding multiple consumers to a shelter layout by copying data from the spreadsheet into the system clipboard, by adding directly from the Toolbox or by manually entering data into a table.

To do this, click on the **Add Multiple Consumers by Tabular Format** button located on the Shelter Window Toolbar. See the Add Multiple Consumers by Tabular Format window

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for further instructions

7.7 Shelter Layout Views

7.7.1 Layout View

Layout View for a shelter behaves the same as the main layout. This is where you can place all the equipment, route links, and run all the methods you can on the main layout view.

7.7.2 Tabular View

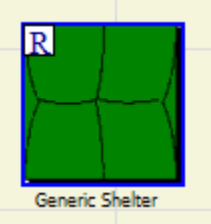
Tabular View for a shelter behaves the same as the tabular view for the main layout, except that items not in the shelter are masked with gray. This is similar to using the tabular view for the main layout and selecting the shelter from the **Shelter Filter** drop down.

7.8 Redundant Generator Requirement

The **Redundant Generator Requirement** is a property of shelters which requires every DISE and breaker box in the shelter to be powered by different generators.

The user may set or remove this requirement for a shelter by right-clicking on a shelter on the main layout and selecting **Require Redundant Generators** from the popup menu that appears.

If a shelter has the **Redundant Generator Requirement** set, an "R" will appear in the shelter icon in place of the normal arrow that exists to show shelter orientation. If the **Redundant Generator Requirement** is being violated within the shelter, the "R" will turn red.



Shelter Icon with Redundant Generator Requirement Set

The **Redundant Generator Requirement** is honored by the AutoConnect algorithm. AutoConnect will NEVER produce results that violate this requirement.

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Part VIII

8 AutoDISE Modes

Seven distinct AutoDISE "modes" exist to permit a variety of functions within a layout:

1. Normal Mode
2. Link Mode
3. Ruler Mode
4. Textbox Mode
5. Drag Layout Mode
6. Zoom mode
7. Staking Link Mode
8. Staking Dimensions Mode

8.1 Normal Mode

Normal Mode is the default mode of AutoDISE. In **Normal Mode**, users may add equipment to layouts, drag items or links, right-click to view right-click options, etc.

If AutoDISE is NOT currently in **Normal Mode**, the user may return to **Normal Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.2 Link Mode

Link Mode is used to manually connect items.

Activate **Link Mode** by clicking on the **Link Mode** button on the Main Toolbar.

When in **Link Mode**, the **Link Mode** button remains depressed and the layout cursor appears as an "L".

In **Link Mode**, the user may drag from one item to another to manually connect them.

Exit **Link Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.3 Ruler Mode

Ruler Mode allows the user to quickly measure how far it is from one position on a layout to another.

Activate **Ruler Mode** by clicking on the **Ruler Mode** button on the Main Toolbar.

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When in **Ruler Mode**, the **Ruler Mode** button remains depressed and the layout cursor appears as a ruler.

To measure the distance between two points, while in **Ruler Mode** click on a single point then move the cursor to a new point. The distance is shown next to the cursor. The user may continue to click multiple points and create a polygonal path. The distance shown is the cumulative distance of the entire path.

Exit **Ruler Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.4 Textbox Mode

Textbox Mode allows the user to add textboxes to the layout.

Activate **Textbox Mode** by clicking on the **Textbox Mode** button on the Main Toolbar.

When in **Textbox Mode**, the **Textbox Mode** button remains depressed and the layout cursor appears as a textbox.

The user may add a textbox to a layout in **Textbox Mode** by simply clicking on the layout at the desired location. This opens the **Textbox Editor** window.

See **Textbox Editor** window for information on editing textboxes.

Exit **Textbox Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.5 Drag Layout Mode

Drag Layout Mode is used to shift the view of a layout without using the scrollbars.

Activate **Drag Layout Mode** by clicking on the **Drag Layout Mode** button on the Main Toolbar.

When in **Drag Layout Mode**, the **Drag Layout Mode** button remains depressed and the layout cursor appears as a hand.

To drag a layout, just click and drag anywhere on the layout.

Exit **Drag Layout Mode** by either:

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- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.6 Zoom Mode

Zoom Mode allows the user to zoom in or out of a layout, or zoom to fit an area or zoom to fit the entire screen.

Description of the various methods for zooming on a layout are found in Setting Zoom for the Main Layout and Setting Zoom for a Shelter Window.

Exit **Zoom Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.7 Staking Link Mode

Staking Link Mode is only available when in the Staking View. **Staking Link Mode** is used to manually connect shelter accesses between shelters with Icon Frameworks.

Activate **Staking Link Mode** by clicking on the **Staking Link Mode** button on the Main Toolbar.

When in **Staking Link Mode**, the **Staking Link Mode** button remains depressed and the **Staking Link Mode** cursor is visible.

In **Staking Link Mode**, if Icon Frameworks are set as visible in Staking View Options, the user may drag from one shelter access to another to manually connect them with a passageway. See Building a Staking Layout.

Exit **Staking Link Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

8.8 Staking Dimensions Mode

Staking Dimensions Mode is only available when in the Staking View. **Staking Dimensions Mode** is used to manually add custom dimension lines to a staking layout.

Activate **Staking Dimensions Mode** by clicking on the **Staking Dimensions Mode** button on the Main Toolbar.

When in **Staking Dimensions Mode**, the **Staking Dimensions Mode** button remains

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depressed and the **Staking DimensionsMode** cursor is visible.

In **Staking Dimensions Mode**, if staking dimensions are set as visible in Staking View Options, the user may add custom dimension lines. See Custom Dimension Lines.

Exit **Staking Dimensions Mode** by either:

- Right-clicking anywhere on the layout; OR
- Clicking on the **Normal Mode** button on the Main Toolbar.

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Part

9 Working With Phase Loads

9.1 How to Determine Phase Loads on an Item

A common task in AutoDISE is to determine the phase loads on a particular item or item connection.

There are three distinct ways to find this information:

1. Open the Layout Item Properties window by double-clicking an item on the layout or right-clicking and selecting **Properties** from the popup menu that appears. In the Layout Item Properties window, open the **Connections Status** tab to view phase loads on each connection of the item

2. If the user moves the mouse over an item on the layout and pauses, a balloon **ToolTip** will appear which contains summary information about the item. Included in this balloon **ToolTip** are the phase loads on the item's input connection.

3. To view item phase loads in Analysis View, open up the Generator Load Summary and Statistics view for the generator powering the desired item. A summary of phase loads is provided in this view.

9.2 Phase Balancing

It is important for three-phase generators to be well balanced because unbalanced loads cause high voltage on lightly loaded phase(s) and low voltage on the higher loaded phase(s). Damage can occur to generators that are significantly unbalanced for an extended period of time.

Balancing loads on a three-phase generator is one of the biggest challenges in the design of AutoDISE layouts. AutoDISE make this task simpler by using balancing routines within AutoConnect and separate load balancing routines.

The balancing routines within AutoConnect use the following steps:

a. Balance all the single phase loads on their respective distribution item.

b. When connecting a single phase distribution item, connect that item to the least loaded phase on the generator.

c. After everything is connected, run a balancing routine which will switch phase connections of single phase loads with unlocked links within each distribution item to best balance the generator.

The balancing routine in step c. above may be run at any time on all items or on selected items on a layout. To run the balancing route, select **Balance Generator Phases** or **Balance**

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Generator Phases (selected) from the Tools Menu.

Unbalanced generators will show a warning above the generator icon if the unbalanced percentage of the generator is greater that the percentage threshold defined in the Warnings Properties tab of the Layout Properties window.

9.3 Overloading Items

Overloaded items are defined as any non-generator item with at least one connection that has at least one phase load that is greater than the rating of that connection. Generators are defined as overloaded if the total phase load on any one phase is greater than the generator rating.

While the AutoConnect algorithm will never forcibly overload any item on a layout, the user may intentionally overload items using manual connect or by changing the electrical configuration of a layout, such as by rotating phases using a universal adapter.

If using manual connect to overload an item, a warning will appear that informs the user they have overloaded an item. If an item was already overloaded prior to running manual connect, the warning will not appear for that item.

In AutoDISE, a warning will appear above an icon for any item in an overloaded state.

9.4 Duty Cycle

Duty Cycle is the proportion of time during which a consumer is operated.

The **Duty Cycle** is expressed in AutoDISE as a percentage of the time a consumer is operated per day.

Suppose an air conditioner operates during the day hours from 8 am to 8 pm, then is shut off for the remainder of the time. The duty cycle would be 12 hours / 24 hours or 0.5.

Duty Cycles are of use when calculating minimum generator size for a large number of consumers. Statistically, if a large number of consumers are powered which have duty cycles less than 1, a smaller generator could be used to power these consumers since the odds of the consumers all being on at one time is lower. This use of statistics and binomial distributions is utilized in the Generator Load Summary and Statistics section of Analysis View.

9.5 Phase Rotation

Between a generator and its consumers, phases may be rotated to achieve better generator balance.

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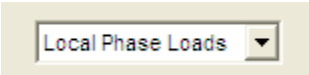
In AutoDISE, phases may be rotated at the generator output connection posts or using a universal adapter. In either case, the rotation must be done using manual connect.

Phase rotation can only be done in one of two ways:

- 120 degree rotation, where phase B on downstream items are powered by phase A of the generator, phase C on the downstream items are powered by phase B of the generator, and phase A on the downstream items are powered by phase C of the generator
- 240 degree rotation, where phase A on downstream items are powered by phase B of the generator, phase B on the downstream items are powered by phase C of the generator, and phase C on the downstream items are powered by phase A of the generator

It is important to recognize when an item is experiencing rotated phases. When this occurs, it can be confusing since the loads on particular connections marked with particular phases may not be contributing to the generator phase load for that phase. To mitigate this concern, AutoDISE, in most cases, informs the user that rotation exists and provides information about how the phase loads on an item compare with the phase loads on a generator.

For example, in the Layout Item Properties window, if an item is experiencing rotated phases, a drop-down item appears at the top of the **Connections Status** tab which allows the user to toggle between Local Phase Loads and Generator Phase Loads:



In the Tabular View, rotation is shown through use of the Phase Rotation Icon.

9.5.1 Generator vs. Local Phase Loads

In AutoDISE, when phase rotation has been set either by rotating phases at the generator output connection posts or through use of a universal adapter, it is important for the user to understand how the phase loads on an item contribute and relate to the phase loads on the generator powering the item.

To make this clearer, AutoDISE defines the following two terms:

- **Generator Phase Loads -** These are the phase loads on an item connection as defined by the phases of the generator.
- **Local Phase Loads -** These are the phase loads on an item connection as defined by the phases that are local to the item.

For example, consider a simple layout where one three phase generator is connected to an M40 which then powers three consumers rated at 5, 10 and 15 Amps, connected to phases C, B and A, respectively. If no rotation exists, the **Connections Status** tab of the Layout Item Properties window for the M40 would look like this:

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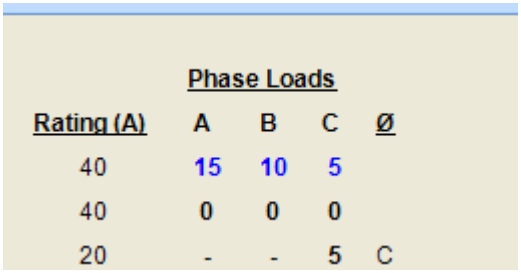
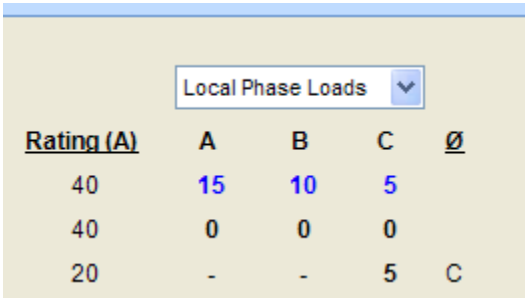


Phase Loads

Rating (A)	A	B	C	Ø
40	15	10	5	
40	0	0	0	
20	-	-	5	C

Now, if the generator to M40 link is re-done, but with a phase rotation of 120 degrees, the same view would look like this:



Local Phase Loads

Rating (A)	A	B	C	Ø
40	15	10	5	
40	0	0	0	
20	-	-	5	C

Note that the Connections Status view defaults to showing **Local Phase Loads**, defined by the phase letters on the nameplate for each connection.

The generator phase loads, however, look like this:

Phase Loads

Device	Loc	# Ø	A	B	C	Rotation
M40	A	3	10	5	15	
Phase Load Totals:			10	5	15	

The **Generator Phase Loads** are different from the M40 **Local Phase Loads** due to the 120 degree rotation.

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Part

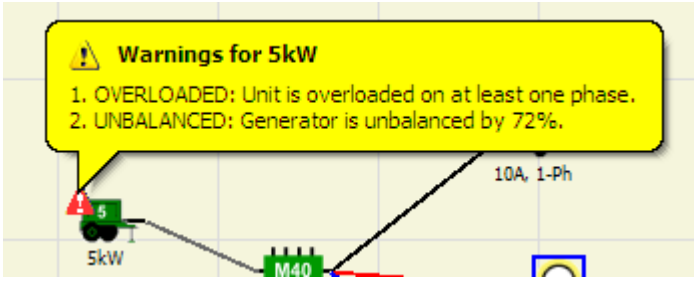
10 Warnings and Callouts

10.1 Warnings

Electrical items in a state of warning are denoted on the layout with a special symbol:

Warning Symbol

This symbol is designed to alert the user that the respective item is in an electrical state that may require attention. The user may move the mouse over the yellow warning icon to view a summary listing of all warning states:



Summary Listing of Warning States

Additionally, if an item callout has been activated for an item in a warning state, viewing the warnings in the callout is an option that may be selected by the user.

Currently, there are three electrical states that result in a warning symbol appearing:

1. **Overloaded**: when at least one phase of the item exceeds the rating of the item
2. **Generator Unbalanced**: when the unbalanced percentage for a 3-phase generator exceeds the value set in Warnings Properties of the Layout Properties window.
3. **Generator Wet-stacking**: when a wet-stacking condition exists. See Wet-stacking for an explanation of this phenomenon.

10.2 Callouts

Item **callouts** are areas of text within a balloon shape that provide summary data about their respective item which look similar to callouts used in Microsoft Word and PowerPoint. The primary difference in AutoDISE is that the data available inside a callout is "live", meaning that the data automatically changes as the state of an item changes.

An example of an item callout is shown below:

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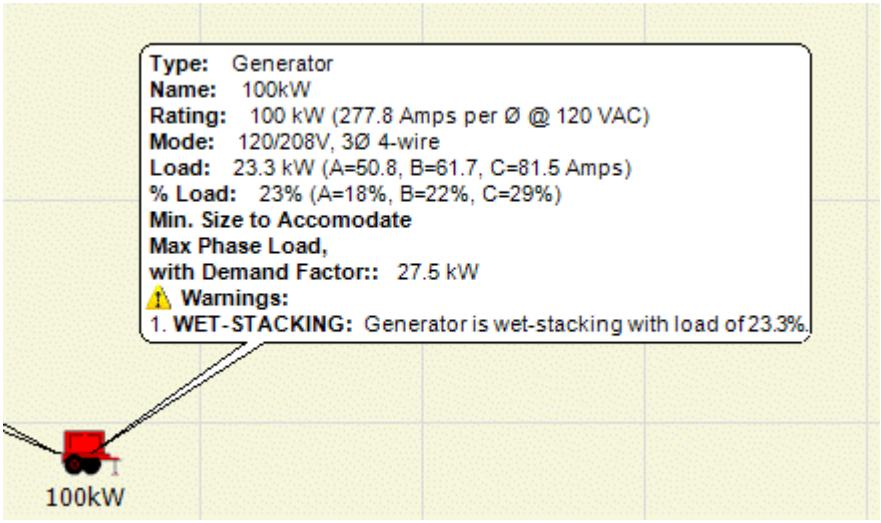
Type: Generator
Name: 100kW
Rating: 100 kW (277.8 Amps per Ø @ 120 VAC)
Mode: 120/208V, 3Ø 4-wire
Load: 23.3 kW (A=50.8, B=61.7, C=81.5 Amps)
% Load: 23% (A=18%, B=22%, C=29%)
Min. Size to Accomodate
Max Phase Load,
with Demand Factor:: 27.5 kW
Warnings:
1. WET-STACKING: Generator is wet-stacking with load of 23.3%.
100kW

Item Callout

Callouts may be activated by right-clicking on the desired item and selecting **Show Item Callout** from the popup menu that appears.

The user may right-click on a callout to reveal two options:

- **Edit Item Callout** - opens the Callout Editor window where the user may select what pieces of information about the item to display in the callout.
- **Hide Item Callout** - hides the item callout

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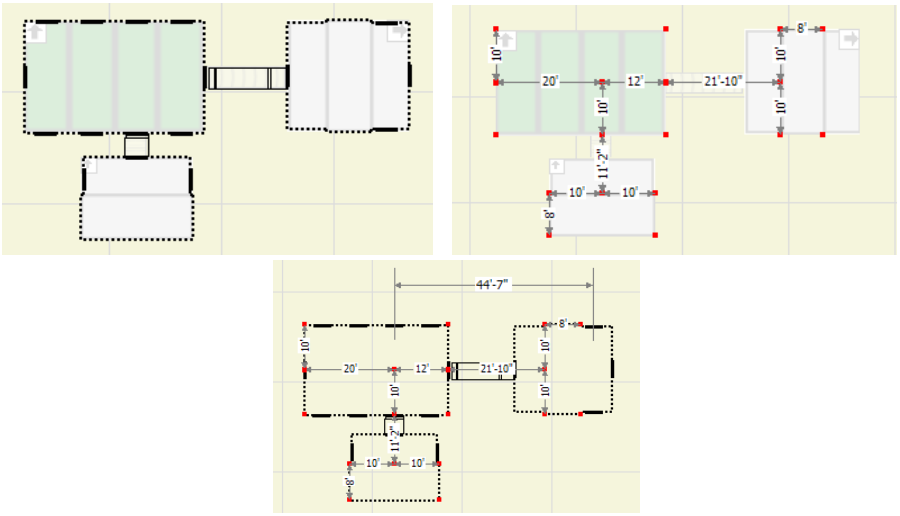
Part

11 Staking

"Staking" in AutoDISE refers to the process of designing and laying out a system of shelters and passageways that are interconnected to form a modular facility, based on the DEPMEDS (Deployable Medical Systems) concept currently in use by hospital layouts in the United States Department of Defense. While the initial version of staking functionality in AutoDISE applies directly to Army DEPMEDS equipment and procedures, the concepts and tools used in staking have potential future use for a wide variety of layout design applications.



Three Views of a Simple Staking Layout

The procedures for designing a staking layout are based on Appendix R of US Army Field Manual FM 4-02.10, *Theater Hospitalization.* The end goal of a staking layout is to provide soldiers in the field a layout map for marking the actual site for construction of the modular facility.

The procedures outlined in this manual for marking a site involve five basic steps:

1. Marking a starting, or control, point at the end of one of the longer corridors in the staking layout design using some visible marker such as a stake or can lid. This point serves as the reference point from which all other points will be measured.
2. Establishing a baseline reference, using string or tape, emanating from the control point down the length of the corridor that was used for determining the control point.
3. Establishing cross-corridor points at perpendicular intersection of the midline of corridors perpendicular to the baseline reference, using some visible marker such as a stake or can lid.
4. Establishing cross-corridor lines, using string or tape, emanating from cross-corridor points down the center of the corridors perpendicular to the baseline reference.
5. Continue throughout the entire layout marking corridor intersection points and marking other key locations such as the corner stakes for shelters and drop points for ISO containers.

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In support of this process, AutoDISE provides a printable layout with a variety of options for viewing a completed layout, including views that show all necessary dimensions and staking points for facilitating these steps.

To begin using the **Staking** features of AutoDISE, see the following help areas:

- Staking Terms and Definitions
- Staking View Options
- Building a Staking Layout

11.1 Staking Terms and Definitions

- **Icon Frameworks:** Icon Frameworks define the dimension of a shelter and the location and orientation of shelter accesses, or locations where passageways can connect. See Icon Frameworks for a detailed explanation.

- **Shelter Accesses:** Shelter accesses are locations in a shelter where passageways can be attached. They are defined by their location, width and type. While all shelter accesses are effectively doorways into a shelter, not all shelter doorways are accesses since not all doorways are locations where passageways may connect. See Shelter Accesses for a detailed explanation.

- **Passageways:** Passageways are pre-defined collections of vestibules and passageway adapters that together form a corridor that attaches two shelters via shelter accesses. The concept of passageways greatly simplifies the building of staking layouts as it alleviates the user from having to specify the multitude of vestibules and adapters needed to connect each set of shelter accesses. AutoDISE automatically detects the type of passageway needed when a connection request is made and provides options if more than one passageway option exists. See Passageways for a detailed explanation.

- **Vestibules:** Vestibules are used for building corridors between shelters. The current version of AutoDISE only uses Army DEPMEDS vestibules. They are 10 feet long and 4 feet wide and require a passageway adapter to physically attach them to a shelter.

- **Passageway Adapters:** Passageway adapters comprise the set of equipment needed to physically attach vestibules to shelters, or a shelter directly to another shelter (e.g., an ISO-to-ISO complexing kit). See Passageway Adapters for a detailed explanation.

- **TEMPER Shelters:** TEMPER (Tent, Extendable, Modular, Personnel) refers to the family of temporary modular shelters that are built based on the concept of sectioning. A single TEMPER section is 20 feet wide with an 8 foot wide side and the ability to have either door or window panels on each side. Combining multiple sections end to end and adding vertical end panels results in shelters that are typically from two sections (16 x 20 ft) to eight sections (64 x 20 ft).

- **ISOs:** ISO (International Organization for Standardization) refers to the family of rigid

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shelters that are transported as 8 x 20 ft container but can fold out to form larger functional shelter spaces. ISOs are typically either 1:1, 2:1 or 3:1, referring to the number of foldout sides relative to the original container. The 1:1 ISOs have no foldouts. The 2:1 ISOs has one long side that folds out to almost double the size of the shelter. The 3:1 ISOs have both long sides fold out to almost triple the size of the shelter. ISOs are primarily used for spaces requiring rigid walls, such as operating rooms, radiology rooms (for heavy equipment mounted to the floor) and pharmacies (for security).

- **Passageway Entry**: A passageway entry in AutoDISE is simply a passageway that connects to a shelter access on a Icon Framework on only one end, thereby creating an entry into the shelter from the outside. Passageway entries consist of a single vestibule and a passageway adapter to connect the vestibule to the shelter. See Passageway Entry.

11.1.1 Staking Framework

"Staking Framework" is a term that refers to the Icon Framework of a shelter which is defined for staking purposes, typically including shelter accesses and staking nodes.

In AutoDISE, a shelter with no assigned staking framework has variable length and width and has no ability to relate or interact with other items or shelters on a layout. In order for a shelter to be connected to another shelter via a passageway, the shelter must have an assigned staking framework which determines how and where passageways may be connected.

See Icon Frameworks for more information.

11.1.2 Shelter Accesses

Shelter Accesses reside on staking frameworks and define where shelters may connect to passageways. Accesses are defined by their location on a framework, their width and their type.

Passageway connector types currently include **ISO**, **Temper End Door**, **Temper Side Door** and **Vestibule**. When connecting two shelters, it is the passageway connector types of the accesses being connected that determines what passageway is selected to be used to connect the shelters. See Building a Staking Layout.

Shelter accesses and actual shelter doorways are related, but are not the exact same thing:

- All shelter accesses correspond to actual doorways into a shelter. They represent openings into the shelter where personnel can enter and exit.

- Not all actual doorways into a shelter are shelter accesses. Shelter accesses ONLY correspond to doorways to which a passageway may connect and lead to another shelter or act as an Passageway Entry.

  For example, a 2:1 ISO shelter has doorways on either end of the main 8 x 20 container. However, these doorways are not used to connect passageways into other shelters, but

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are used for direct access into the ISO from the outside. These doorways, therefore, have no corresponding shelter access.

Shelter accesses may be added, edited and deleted from user-defined Icon Frameworks using the Edit Icon Framework window.

11.1.3 Passageways

Passageways are pre-defined collections of vestibules and passageway adapters that together form a corridor that attaches two shelters via shelter accesses.

Passageways are stored and managed in the Passageway Manager. In this window, a user may view existing passageways, and add and edit user-defined passageways.

The purpose of passageways is to simplify the staking layout design process. When connecting two shelter accesses on a staking layout, the designer has a limited number of options for how this is accomplished, since the passageway connector types exposed at the passageway ends determine the kind of adapter required at each end.

For example, if connecting a **Temper End Door** type access on one shelter to a **Temper Side Door** type access on a second shelter, a user MUST use a **Temper End Door Vestibule Adapter** and a **Temper Side Door Vestibule Adapter** with an optional vestibule between them. The only real option for the user is how many vestibules to insert end to end.

Therefore, rather than requiring the user to specify every adapter needed, AutoDISE searches the Toolbox for every passageway which has end types that match the access types being connected. If more than one exists, the user is prompted for which one. This greatly simplifies the task of building of staking layouts.

11.1.3.1 Passageway Adapters

Passageway Adapters represent actual adapters used in shelter corridors which are required to connect shelters directly to other shelters or connect shelters via vestibules.

Currently, AutoDISE recognizes four passageway adapters:

- **Complexing Kit, ISO to ISO**: required to connect two ISO shelter accesses to each other
- **Complexing Kit, TEMPER to ISO**: required to connect an ISO passageway connector type to a vestibule passageway connector type, such as that on a vestibule or a TEMPER vestibule adapter
- **TEMPER End Door Vestibule Adapter**: required to connect a TEMPER end door passageway connector type to a vestibule passageway connector type, such as that on a vestibule or a TEMPER vestibule adapter
- **TEMPER Side Door Vestibule Adapter**: required to connect a TEMPER side door

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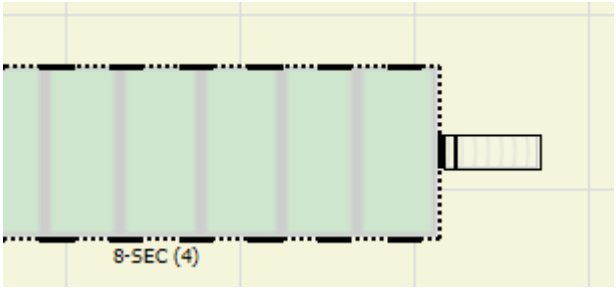
passageway connector type to a vestibule passageway connector type, such as that on a vestibule or a TEMPER vestibule adapter

11.1.4 Passageway Entry

An **Passageway Entry** in AutoDISE is simply a passageway that connects to a shelter access on a Icon Framework on only one end, thereby creating an entry into the shelter from the outside. Passageway entries consist of a single vestibule and a passageway adapter to connect the vestibule to the shelter.



A Passageway Entry

To add a Passageway Entry to a shelter:

1. While AutoDISE is in the Staking View, ensure that shelter and passageway frameworks are visible. If not, show them via the Staking View Options window.

2. Activate Staking Link Mode by clicking on the **Staking Link Mode** button on the Main Toolbar.

3. Move the mouse over the desired access until it is highlighted, then right-click and select **Add Passageway Entry** from the menu that appears.

To remove a passageway entry, return to Normal Mode then right-click on the entry and select **Delete** from the menu that appears.

11.1.5 Passageway Connector Types

All shelter accesses, passageway adapters and vestibules have **Passageway Connector Types** which define which components may connect to each other.

Passageway Connector Types currently include:

- **ISO:** All ISO accesses are of this type as well as ISO Complexing Kits used to attach ISOs to ISOs or ISOs to vestibules

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- **Temper End Door:** This the type of a TEMPER end door and the corresponding TEMPER End Door to Vestibule adapter

- **Temper Side Door:** This the type of a TEMPER side door and the corresponding TEMPER Side Door to Vestibule adapter

- **Vestibule:** This is the type of both ends of a vestibule and one end of the TEMPER-to-vestibule adapters

11.2 Staking View Options

When viewing a staking layout the user has options for what information to view on the layout. Oftentimes with staking layouts the large amount of information that is available about the layout makes the layout view cluttered and difficult to understand. The **Staking View Options** permit the user to only view the information that is currently of interest.

The options include:

- **Show Dimensions**: Shows all automated and custom staking dimensions.
- **Show Shelter and Passageway Frameworks**: Shows all shelter and passageway frameworks.
- **Show Textboxes and Item Callouts**: Shows all textboxes and item callouts for items whose icons are visible in the staking layout.
- **Show Shelter and Passageway Icons**: Shows all shelter and passageway icons
- **Show Other Icons**: Shows all non-shelter and non-passageway icons
- **Show Icon Captions**: Shows all icon captions

To modify the current Staking View Options for a staking layout:

1. Ensure AutoDISE is in the Staking View by clicking on the **Staking** tab.
2. Click on the **Staking View Options** button on the Main Toolbar to open the Staking View Options window.
3. Modify the options and click the **Save** button.

See Staking View Options window for more information on the options available.

11.3 Dimensions

Since the fundamental goal of the Staking procedure is to determine the dimensions required to layout and build a shelter structure, the ability to view dimensions on the staking layout is of prime importance.

In AutoDISE, dimensioning is broken down into two distinct categories:

1. **Automated dimensions**: Automated dimensions provide all the pertinent dimensions between staking nodes and shelter access centerlines required for a soldier to correctly

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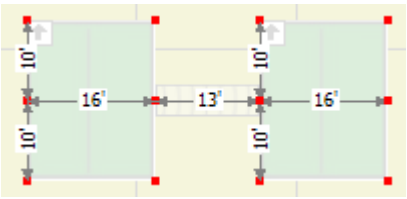
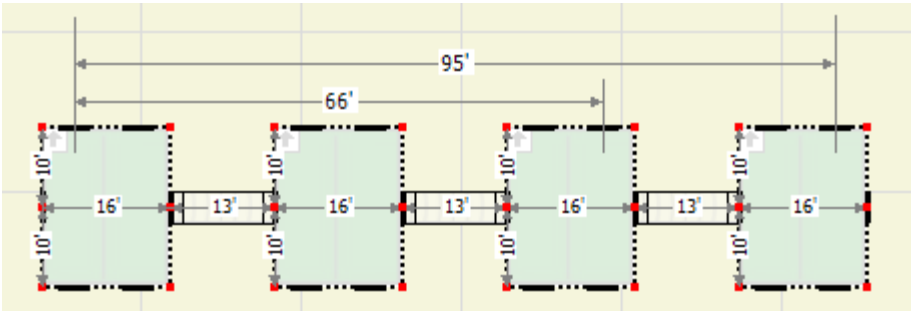
construct an actual layout on site. An example is shown below:



Automated Dimensions

Automated dimensions require no work on the part of the user, except to modify the Staking View Options to make them visible.

2. **Custom dimension lines**: Automated dimensions do not provide dimensions that span shelters except when through a passageway. In some cases a user may want to know dimensions across several shelters. In such cases, a user may define a **custom dimension line**. An example is shown below:



Custom Dimension Lines

Custom dimension lines show the distance between the centerline of two shelter accesses. In the current version of AutoDISE, the portion of the dimension line that emanates from the shelter access may only be perpendicular to the shelter access.

The following rules apply:

- Both shelter accesses must be on the same "framework structure", meaning that the Icon Frameworks to which the two accesses belong must be attached to each other via passageways and other frameworks.
- Both shelter accesses must be oriented vertically or both must be oriented horizontally.
- As shown in the example above, several dimension lines may use the same shelter access reference line.

For a complete description of custom dimension lines and how to create them, see Custom Dimension Lines.

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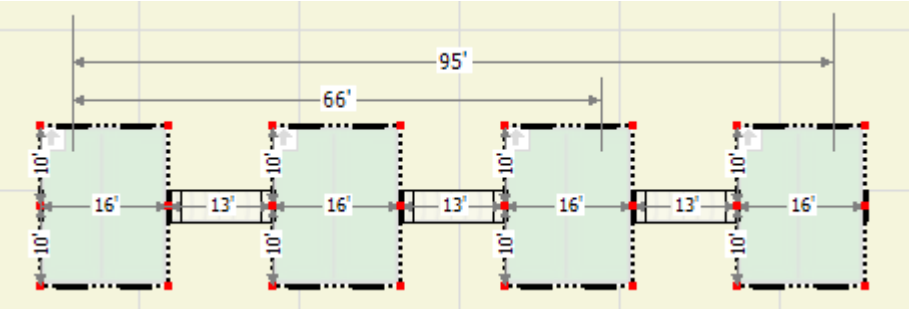
11.3.1 Custom Dimension Lines

Automated dimensions do not provide dimensions that span shelters except when through a passageway. In some cases a user may want to know dimensions across several shelters. In such cases, a user may define a **custom dimension line**. An example is shown below:



Custom Dimension Lines

Custom dimension lines show the distance between the centerline of two shelter accesses. In the current version of AutoDISE, the portion of the dimension line that emanates from the shelter access may only be perpendicular to the shelter access.

The following rules apply:

- Both shelter accesses must be on the same "framework structure", meaning that the Icon Frameworks to which the two accesses belong must be attached to each other via passageways and other frameworks.
- Both shelter accesses must be oriented vertically or both must be oriented horizontally.
- As shown in the example above, several dimension lines may use the same shelter access reference line.

Creating a Custom Dimension Line

To create a custom dimension line, the user must first add the two boundary reference lines for the dimension desired. In the current version of AutoDISE, these two reference lines emanate perpendicular from the centerline of shelter accesses.

To add a reference line:

1. Ensure that Icon Frameworks are visible on the Staking View by opening the Staking View Options window and ensuring the **Show Shelter and Passageway Frameworks** option is checked.
2. Activate Staking Dimensions Mode by clicking on the **Staking Dimensions Mode** button on the Main Toolbar. Icon Frameworks must be visible
3. Move the mouse over the desired shelter access, right-click and select **Add Dimension Reference Line** from the menu that appears. The reference line is now visible.

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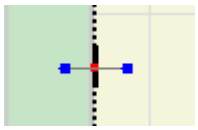
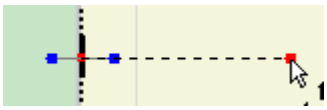


Dimension Reference Line

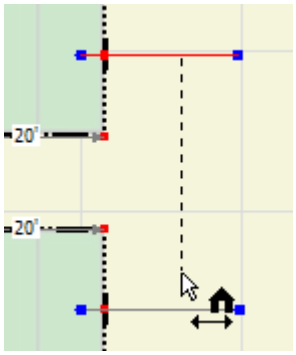
4. Repeat this on the second desired shelter access

5. The blue squares are handles that only appear in Staking Dimension Mode. Move the mouse over a handle and then click and drag to move the handle to lengthen each reference line.



Dragging the Reference Line Handle

6. To create the dimension line between the reference lines, move the mouse over one of the reference lines until it turns red. Then click and drag to the second reference line until it turns red. As the mouse is dragged, a dashed line is drawn to show where the new dimension line will be added. Release the mouse to add the new dimension line.



Dragging Between Reference Lines

7. After a dimension line is created, the reference lines and dimension line may both be dragged and moved. Drag reference lines as shown earlier. Note that the user may not drag a reference line past the location of the dimension line. To move the dimension line, move the mouse over the dimension line until it turns red, then click and drag the line. Note that the user may not drag the dimension line past either reference line end points.

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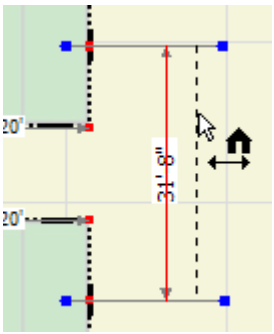
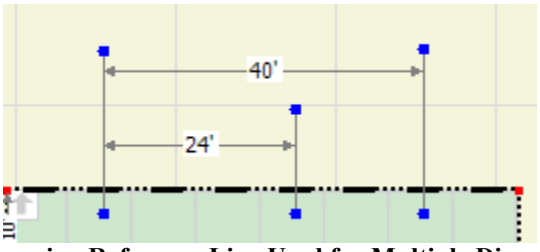


Dragging the Dimension Line

8. A dimension reference line may be used for multiple dimension lines, but one and only one dimension line may exist for any two reference lines.



Example of Dimension Reference Line Used for Multiple Dimension Lines

Removing Dimension Lines

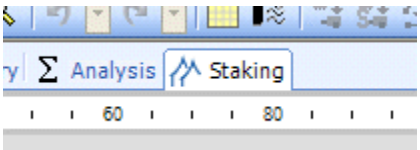
To remove dimension lines or dimension reference lines, simply activate Staking Dimensions Mode by clicking on the **Staking Dimensions Mode** button on the Main Toolbar, move the mouse over the desired object until it is highlighted, then right-click and select either **Remove Dimension Line** or **Remove Dimension Reference Line**, as appropriate.

Note: When a dimension reference line is removed, any dimension lines using that reference line will also be removed. In other words, dimension lines only are shown if BOTH reference lines to which they refer are also shown.

11.4 Building a Staking Layout

The following are basic steps for building a staking layout:

1. Ensure AutoDISE is in the Staking View by clicking on the **Staking** tab.



Note: Notice that the Toolbox has changed to the "Staking Toolbox", which only contains shelters, split into those with frameworks and those without.

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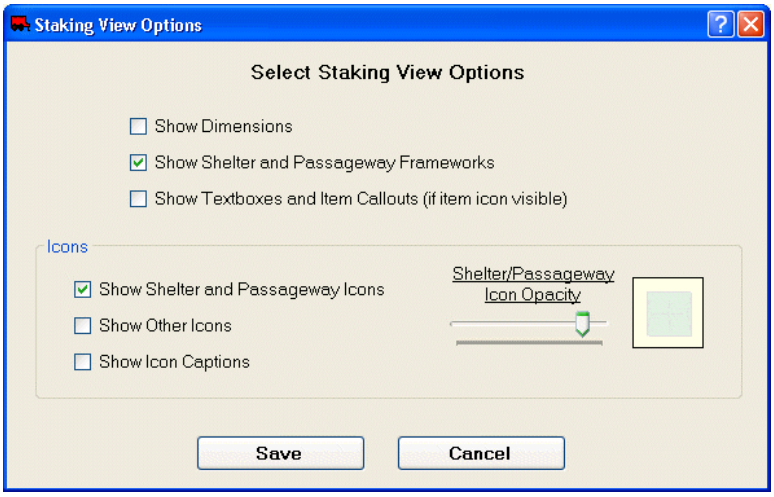
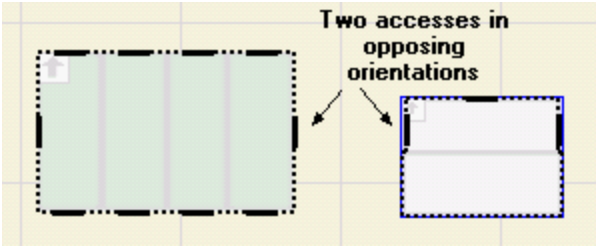
2. Ensure that Icon Frameworks are visible on the Staking View by opening the Staking View Options window and ensuring the **Show Shelter and Passageway Frameworks** option is checked. For clarity, it is also helpful to uncheck ALL other options except **Show Shelter and Passageway Icons**.



3. Open the **Staking Toolbox** and add two shelters with frameworks to the layout.

4. To connect two shelters, the two shelter accesses the user desires to connect must be oriented in opposite directions. If the desired two accesses are not oriented this way, then rotate the shelter icons until this is achieved.



5. Activate Staking Link Mode by clicking on the **Staking Link Mode** button on the Main Toolbar.

6. Move the mouse over one of the two desired shelter accesses until the access is highlighted in blue

.

7. Left-click on access and drag until the mouse is over the second access and it is highlighted in blue, then release the mouse.

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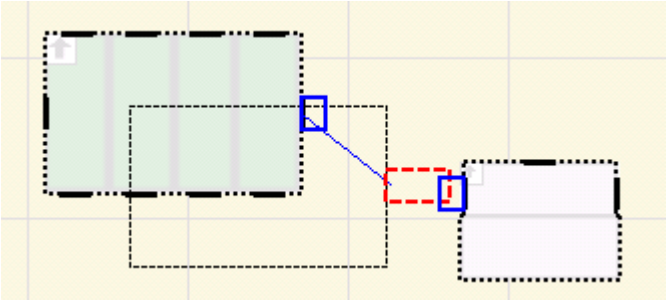
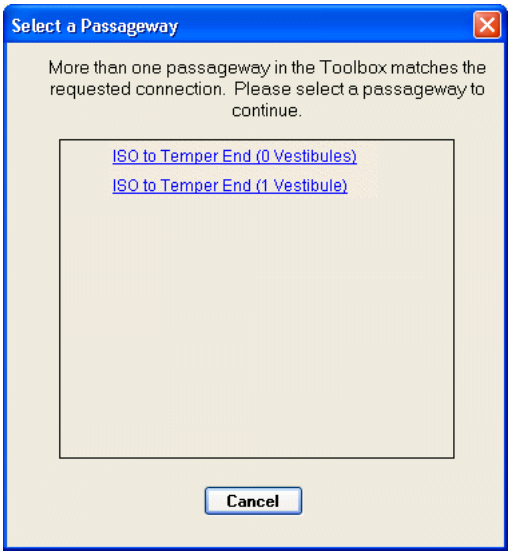


8. If there is only one passageway available that matches the passageway connector types of the two selected accesses, then the two accesses will automatically be connected via that passageway. If more than one matching passageway exists, AutoDISE will prompt the user to select which passageway to use.


Select a Passageway
More than one passageway in the Toolbox matches the requested connection. Please select a passageway to continue.
ISO to Temper End (0 Vestibules)
ISO to Temper End (1 Vestibule)
Cancel

9. Once two shelters are connected and the layout is returned to Normal Mode, they may be dragged and dropped as a single unit and will maintain their relative position to each other as defined by the connected passageway.

10. Continue to add, rotate and connect shelters in this manner until all desired shelters have been connected.

11. To disconnect a connected shelter, right-click on the shelter icon and select **Disconnect Icon Framework** from the menu that appears. Doing so will also remove any passageways that were connected to that framework. Optionally, the user may delete individual passageways by right-clicking on passageway icons and selecting **Delete** from the menu that appears.

12. View the staking layout with dimensions shown by opening the Staking View Options window and unchecking all options except the **Show Shelter and Passageway Icons** and **Show Dimensions** options. Staking Nodes are shown in red and pertinent

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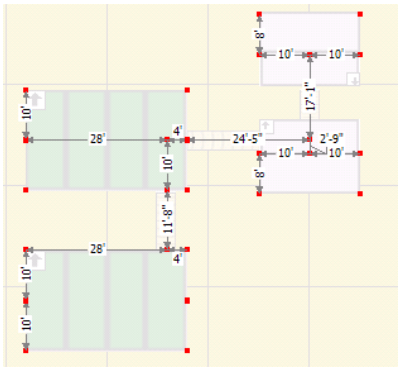
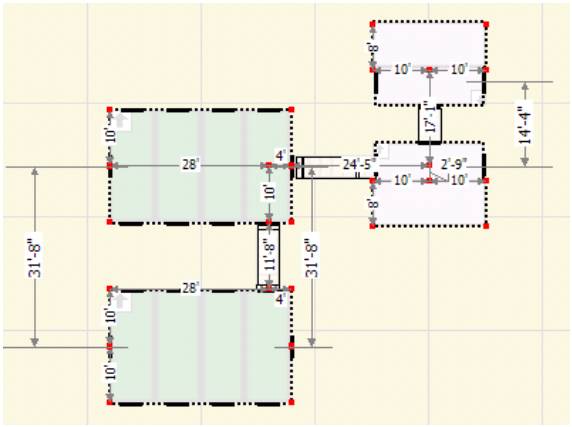
dimensions are shown.



13.Add Custom Dimension Lines.



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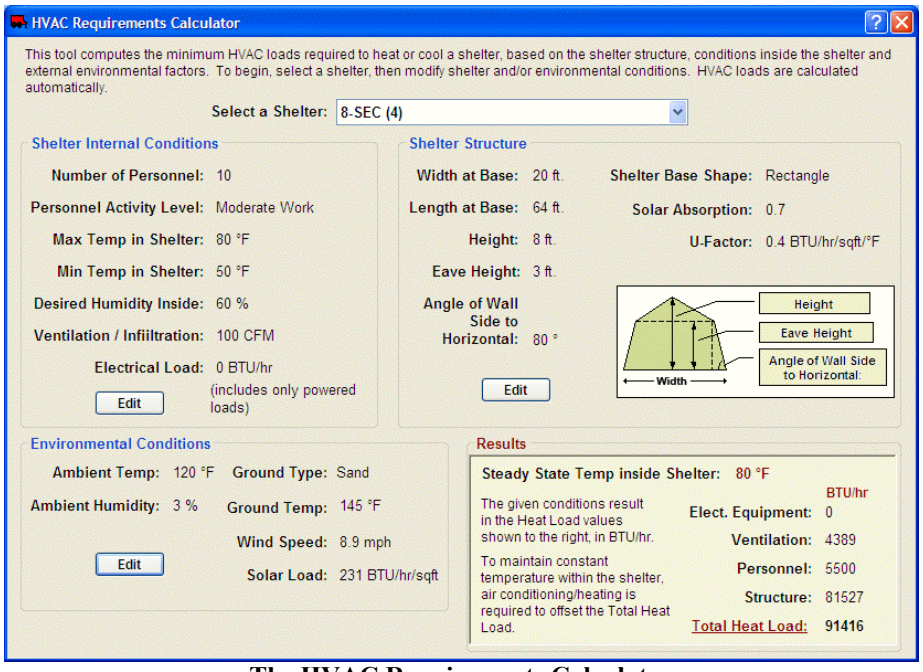
Part XII

12 HVAC Requirements Calculator

For a facilities layout designer, the process of determining the heating or cooling requirements for a shelter can be a challenging task. The overall goal of this process is to estimate the size of the heating or cooling equipment required for given environmental conditions, shelter size and structure, and desired shelter internal conditions such as number of personnel, amount of equipment, desired temperature and humidity, etc.


HVAC Requirements Calculator
This tool computes the minimum HVAC loads required to heat or cool a shelter, based on the shelter structure, conditions inside the shelter and external environmental factors. To begin, select a shelter, then modify shelter and/or environmental conditions. HVAC loads are calculated automatically.
Select a Shelter: 8-SEC (4)
Shelter Internal Conditions
Number of Personnel: 10
Personnel Activity Level: Moderate Work
Max Temp in Shelter: 80 °F
Min Temp in Shelter: 50 °F
Desired Humidity Inside: 60 %
Ventilation / Infiiltration: 100 CFM
Electrical Load: 0 BTU/hr
(includes only powered loads)
Edit
Shelter Structure
Width at Base: 20 ft.
Length at Base: 64 ft.
Height: 8 ft.
Eave Height: 3 ft.
Angle of Wall Side to Horizontal: 80 °
Shelter Base Shape: Rectangle
Solar Absorption: 0.7
U-Factor: 0.4 BTU/hr/sqft/°F
Edit
Height
Eave Height
Angle of Wall Side to Horizontal
Width
Environmental Conditions
Ambient Temp: 120 °F
Ground Type: Sand
Ambient Humidity: 3 %
Ground Temp: 145 °F
Wind Speed: 8.9 mph
Solar Load: 231 BTU/hr/sqft
Edit
Results
Steady State Temp inside Shelter: 80 °F
The given conditions result in the Heat Load values shown to the right, in BTU/hr.
To maintain constant temperature within the shelter, air conditioning/heating is required to offset the Total Heat Load.
BTU/hr
Elect. Equipment: 0
Ventilation: 4389
Personnel: 5500
Structure: 81527
Total Heat Load: 91416

The HVAC Requirements Calculator

The **HVAC Requirements Calculator** is designed to simplify this process and provide an easy-to-use module for calculating heating and cooling needs. The calculator accepts data input in four basic areas:

1. Environmental Conditions
2. Shelter Internal Conditions
3. Shelter Structure
4. Electrical Load

The user can modify the variables in each area to suit the actual conditions. For information on how to modify these variables, see HVAC Requirements Calculator window.

The output, or results, of the **HVAC Requirements Calculator** algorithm is a listing of the **Heat Load** values for each of the above areas and a **Total Heat Load** summation of these values, in BTU/hr:

- **Electrical Equipment**: The electrical load in the shelter, converted to BTU/hr. See Electrical Load.

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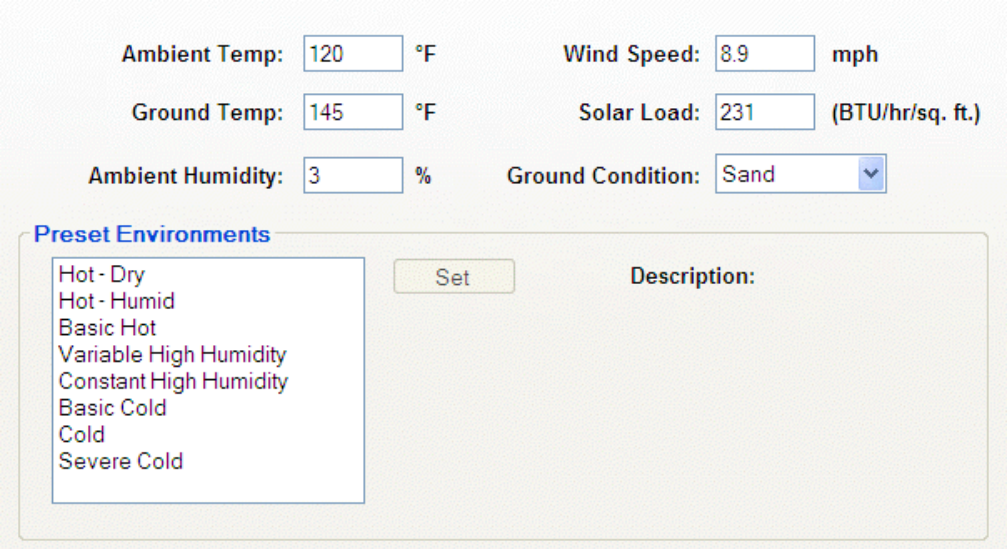
- **Ventilation**: The heat load due to ventilation and infiltration of air into the shelter from outside.
- **Personnel**: The heat load due to personnel in the shelter.
- **Structure**: The heat load due to the environmental conditions outside the shelter, the desired conditions inside the shelter and the structure and material of the shelter.
- **Total Heat Load**: The total amount of energy that must be removed from or added to the shelter every hour to maintain the desired internal conditions specified in the Shelter Internal Conditions section. Positive values indicate that air conditioning cooling equipment, such as an ECU, is required, while negative values indicate that heating equipment is required.

For a detailed explanation of the HVAC Requirements Calculator algorithm, see HVAC Requirements Calculator Algorithm in the appendices.

For example, in the image above, the **Total Heat Load** is calculated to be **91416 BTU/hr**. This means that an air conditioning unit rated to at least **91416 BTU/hr** is required to maintain the stated desired internal shelter temperatures.

12.1 Environmental Conditions

Environmental Conditions represent the average conditions of the environment external to a shelter:



Environmental Conditions

- **Ambient Temperature:** The ambient temperature, in degrees Fahrenheit.
- **Ground Temperature:** The ground temperature, in degrees Fahrenheit.
- **Ambient Humidity:** The ambient humidity, as a percentage.
- **Wind Speed:** Wind speed in miles per hour.
- **Solar Load:** A measure of the heating ability of the sun (short wave solar radiation) on a surface, measured in BTU/hr/sq. ft. This value can be found in climatic condition

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manuals such as Army Regulation AR 70-38, *Research, Development, Test and Evaluation of Materiel For Extreme Climatic Conditions.*

- **Ground Condition:** The type of ground surface. Options include Grass/Dirt, Sand or Frozen

Environmental Conditions may be modified by opening the Environment tab in the Layout Properties window.

Preset Environments

AutoDISE provides 8 preset environments that can be used if environmental conditions are not available. These are extreme values for particular climates in the world that can be used for design purposes. The options and descriptions are shown below.

Environment	Description
Hot - Dry	Hot-Dry conditions are found seasonally in the deserts of Northern Africa, the Middle East, Pakistan and India, Southwestern United States, and Northern Mexico. The extreme condition takes place at 1600 hours.
Hot - Humid	Hot-Humid conditions occur along narrow strips bordering bodies of water with high surface temperatures, specifically the Persian Gulf and the Red Sea. The extreme condition takes place at 1300 hours.
Basic Hot	Basic Hot conditions exist in many parts of the world extending outward from the areas of Hot-Dry conditions in the United States, Mexico, Africa, Asia and Australia. They also occur in Southern Africa, South America, Southern Spain, and in Southwest Asia. The extreme condition takes place at 1400 hours.
Variable High Humidity	High Humidity conditions are found most often in tropical areas, although they occur briefly or seasonally in the mid-latitudes. Variable High Humidity represents conditions found in the open in tropical areas. The extreme condition takes place at 1400 hours.
Constant High Humidity	High Humidity conditions are found most often in tropical areas, although they occur briefly or seasonally in the mid-latitudes. Constant High Humidity represents conditions in the heavily forested areas where nearly constant conditions may prevail during rainy and wet seasons. The extreme condition takes place between 2100 and 0600 hours.
Basic Cold	Basic Cold conditions are found only in the Northern Hemisphere south of the coldest areas and on high latitude coasts (e.g., the southern coast of Alaska), where maritime effects prevent occurrence of very low temperatures. The extreme condition takes place between 0200 and 0600 hours.

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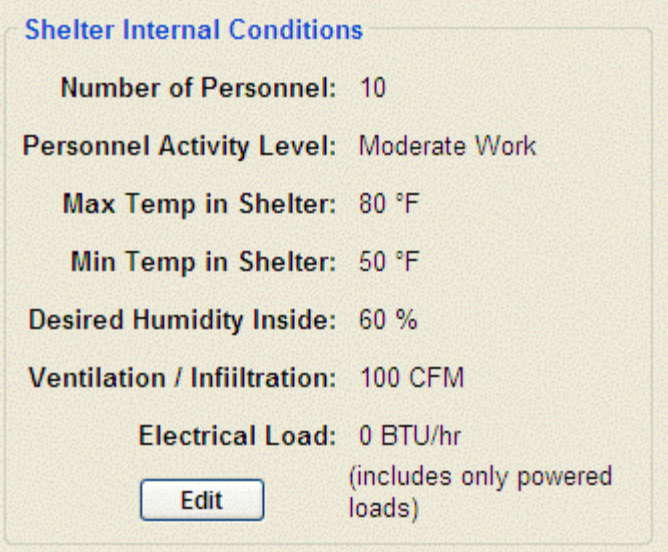
Cold	Cold conditions are found in the Northern Hemisphere in Canada, Alaska, Greenland, Northern Scandinavia, Northern Asia and Tibet. Very small areas of the Cold type may be found at higher elevations in both the Northern and Southern Hemisphere (e.g., Alps, Himalayas, and the Andes). The extreme condition takes place between 0100 and 0600 hours.
Severe Cold	Severe Cold conditions are found in the Northern Hemisphere in the interior of Alaska, extending in to the Yukon in Canada. They also exist in the interior of the northern islands of the Canadian Archipelago, on the Greenland icecap, and in Northern Asia. The extreme condition takes place throughout the 24-hour period.

12.2 Shelter Internal Conditions

Shelter Internal Conditions represent the actual and desired working conditions inside the shelter:


Shelter Internal Conditions
Number of Personnel: 10
Personnel Activity Level: Moderate Work
Max Temp in Shelter: 80 °F
Min Temp in Shelter: 50 °F
Desired Humidity Inside: 60 %
Ventilation / Infiiltration: 100 CFM
Electrical Load: 0 BTU/hr
Edit
(includes only powered loads)

Shelter Internal Conditions

- **Number of Personnel**: The actual number of individuals in the shelter.
- **Personnel Activity Level**: The activity level, on average, of the individuals in the shelter. Options include:

  1. At Rest
  2. Light Office Activity
  3. Moderate Work
  4. Light Bench Work
  5. Heavy Bench Work

- **Maximum Temperature in the Shelter**: The highest desired temperature inside the shelter.

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- **Minimum Temperature in Shelter**: The lowest desired temperature inside the shelter.
- **Desired Humidity Inside**: The desired humidity inside the shelter.
- **Ventilation/Infiltration**: The amount of air, in cubic feet per minute (CFM), ventilated into or infiltrating the shelter from the outside:

    1. ***Ventilation*** is the intentional forced addition of outside air into the shelter. The minimum ventilation requirement is 10 CFM per shelter occupant.
    2. ***Infiltration*** results from wind penetration into the shelter through entrances into the shelter. It is sometimes assumed that the entire volume of the shelter is replaced every hour due to infiltration.

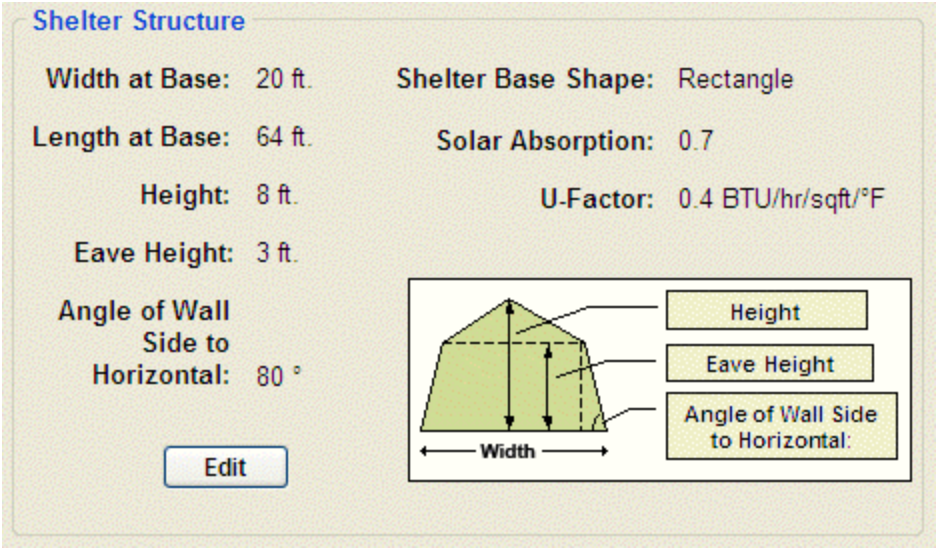
    A good estimate of ventilation/infiltration for most shelters is 10 CFM per shelter occupant.

- **Electrical Load**: The total rated load in kilowatts of all consumers in the shelter. Since the heat load due to this electrical load is totaled separately, electrical load is covered in a separate section of this manual, Electrical Load.

The **Shelter Internal Conditions** may be modified in the Modify Shelter Internal Conditions window. See HVAC Requirements Calculator window for further instructions.

12.3 Shelter Structure

Shelter Structure represents the actual physical size, shape and material of a shelter:



Shelter Structure

- **Width at Base**: The width at the shelter base, in feet.
- **Length at Base**: The length at the shelter base, in feet.
- **Height**: The height of the shelter. See image above.
- **Eave Height**: The height from the ground to the top of the side wall. See image above

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- **Angle of Wall Side to Horizontal**: The angle between the horizontal ground and the wall side. See image above.

  ***Note:* If the Shelter Base Shape is set to Rectangular Dome, then the Eave Height and Angle of Wall Side to Horizontal have no meaning and can be ignored.**

- **Shelter Base Shape**: The basic shape of the shelter. Options include:

  1. Rectangle
  2. Hexagon
  3. Octagon
  4. Rectangular Dome

- **Solar Absorption**: A dimensionless property of the shelter skin material that determines the fraction of long wave solar radiation absorbed by the material. Solar absorption, or "solar absorptivity", ranges between 0 and 1. A perfectly transparent material that absorbs no long wave solar radiation, such as clear glass, has a solar absorption of 0. A black material that absorbs ALL long wave solar radiation would have a solar absorption of 1. Typical Army shelter materials have a solar absorption value of approximately 0.7.

- **U-Factor**: The overall heat transfer coefficient, or conductance, of an insulating material. The U-Factor of an insulator includes its thermal resistance, which itself is dependent on material thickness, and natural convection films on either side of the insulator. More specifically, this coefficient represents the total heat flow per unit area per unit time through a material given the material properties, material thickness, convection conditions on both sides of the material and temperature difference between the two sides of the material.

  ***Note:* Since this coefficient is dependent on such a wide variety of factors, it is extremely difficult to calculate and typically requires the user to input a value that is an average for a variety of conditions and materials. While U-Factors are oftentimes stated for windows, U-Factors for military shelters may be difficult to find. For that reason, the AutoDISE user who does not have access to such numbers should use the accepted Army default value of 0.4 BTU/hr/sqft/° F.**

The **Shelter Structure** factors may be modified in the Modify Shelter Structure window. See HVAC Requirements Calculator window for further instructions.

12.4 Electrical Load

Electrical Load represents the total rated load in kilowatts of all consumers in the shelter.

The Electrical tab of the Layout Properties contains an option so use demand loads when calculating the total load of consumers. If this option is checked, the electrical load total will be adjusted based on the demand factor set for the respective shelter.

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Since this value is dependent on the number and rating of consumers in a shelter, this value may not be directly manipulated, except by adding, removing or editing the rating of consumers in the shelter.

***Note:** When the heat load due to electrical equipment is calculated, it is simply a direct conversion of the Electrical Load into BTU/hr. Using this method provides a conservative estimate of the heat load due to electrical consumers since the majority of electrical energy delivered to inductive loads is converted into mechanical energy, not heat.*

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Part XIII

13 AutoDISE Windows

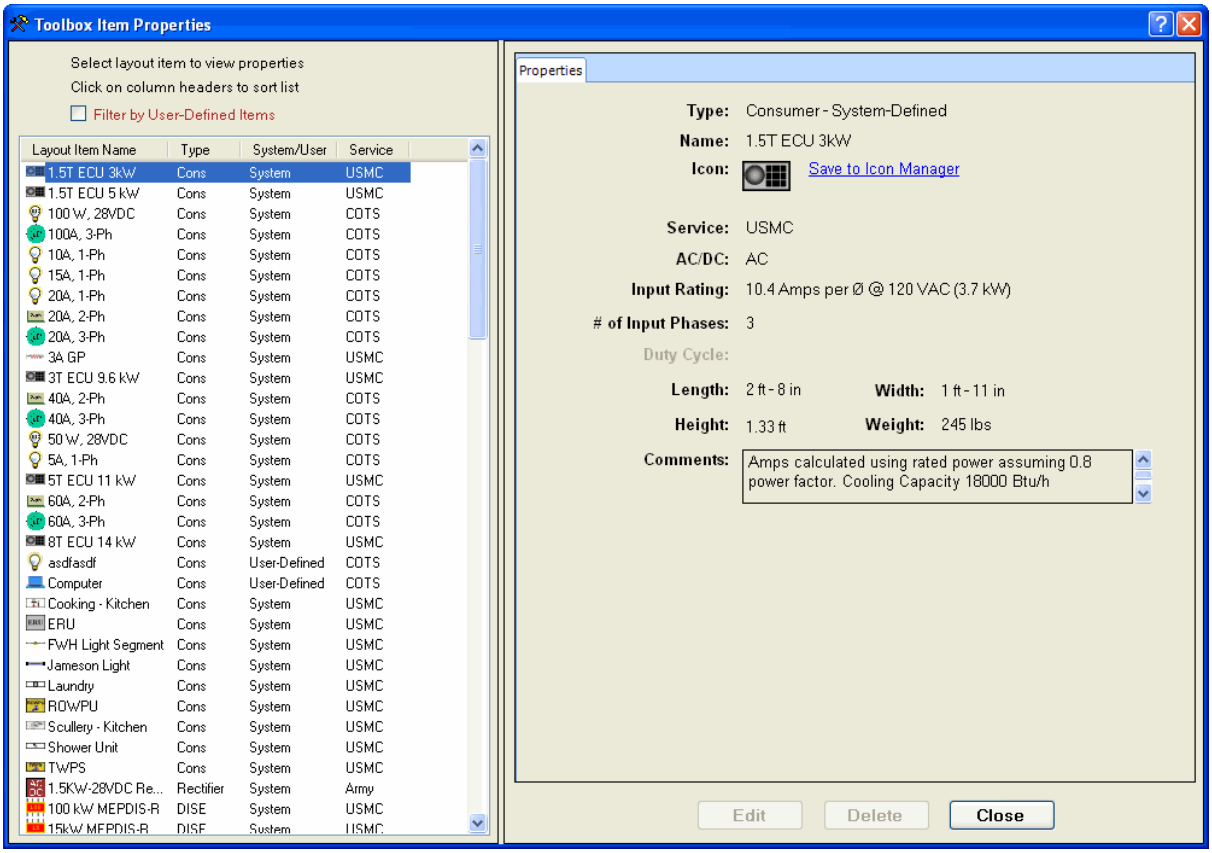
13.1 Toolbox Item Properties

To view the properties of an item in the Toolbox, either:

1. Open up the Toolbox, right-click on the desired item and select **Properties** from the popup menu that appears, OR

2. Select **View Toolbox Items** from the Toolbox Menu.

This opens the **Toolbox Item Properties** window. Select the desired item from the list on the left to see the item properties on the right.


Toolbox Item Properties
Select layout item to view properties
Click on column headers to sort list
Filter by User-Defined Items
Layout Item Name
Type
System/User
Service
1.5T ECU 3kW Cons System USMC
1.5T ECU 5 kW Cons System USMC
100 W, 28VDC Cons System COTS
100A, 3-Ph Cons System COTS
10A, 1-Ph Cons System COTS
15A, 1-Ph Cons System COTS
20A, 1-Ph Cons System COTS
20A, 2-Ph Cons System COTS
20A, 3-Ph Cons System COTS
3A GP Cons System USMC
3T ECU 9.6 kW Cons System USMC
40A, 2-Ph Cons System COTS
40A, 3-Ph Cons System COTS
50 W, 28VDC Cons System COTS
5A, 1-Ph Cons System COTS
5T ECU 11 kW Cons System USMC
60A, 2-Ph Cons System COTS
60A, 3-Ph Cons System COTS
8T ECU 14 kW Cons System USMC
asdfasdf Cons User-Defined COTS
Computer Cons User-Defined COTS
Cooking - Kitchen Cons System USMC
ERU Cons System USMC
FWH Light Segment Cons System USMC
Jameson Light Cons System USMC
Laundry Cons System USMC
ROWPU Cons System USMC
Scullery - Kitchen Cons System USMC
Shower Unit Cons System USMC
TWPS Cons System USMC
1.5KW-28VDC Re... Rectifier System Army
100 kW MEPDIS-R DISE System USMC
15kW MEPDIS-R DISE System USMC
Properties
Type: Consumer - System-Defined
Name: 1.5T ECU 3kW
Icon:
Save to Icon Manager
Service: USMC
AC/DC: AC
Input Rating: 10.4 Amps per Ø @ 120 VAC (3.7 kW)
# of Input Phases: 3
Duty Cycle:
Length: 2 ft - 8 in
Width: 1 ft - 11 in
Height: 1.33 ft
Weight: 245 lbs
Comments: Amps calculated using rated power assuming 0.8 power factor. Cooling Capacity 18000 Btu/h
Edit
Delete
Close

Toolbox Item Properties Window

See **Toolbox Item Properties** for:

- Generators
- Distribution Equipment
- Consumers
- Transformers
- DC Rectifiers
- Inverters

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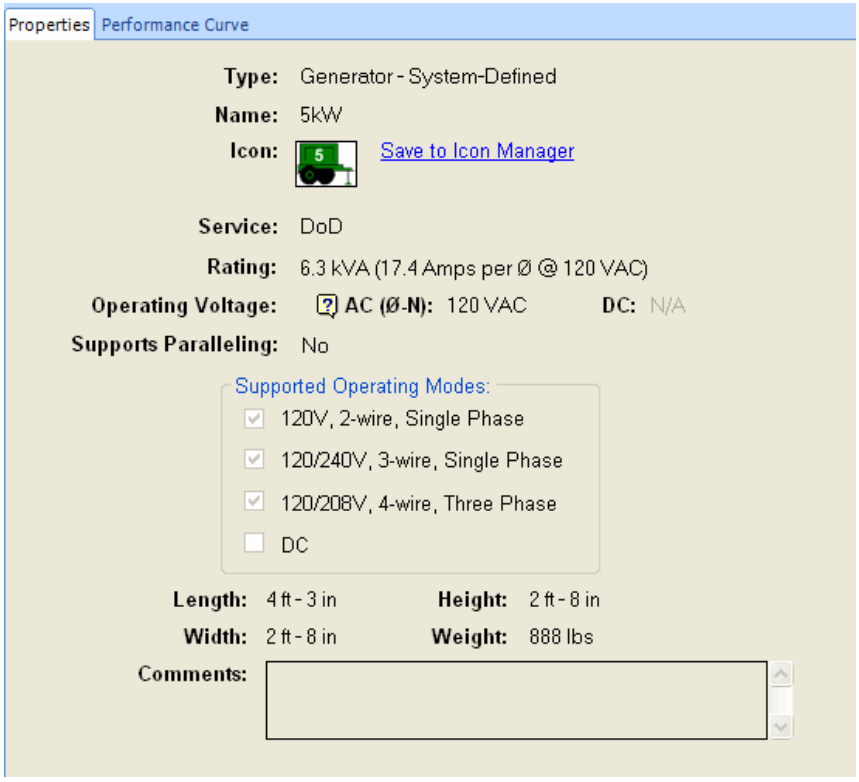
- Non-electrical Equipment
- Shelter/Tents

13.1.1 Generators

The **Properties** tab of the **Toolbox Item Properties** window for generators is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).


Properties
Performance Curve
Type: Generator - System-Defined
Name: 5kW
Icon:
Save to Icon Manager
Service: DoD
Rating: 6.3 kVA (17.4 Amps per Ø @ 120 VAC)
Operating Voltage: AC (Ø-N): 120 VAC DC: N/A
Supports Paralleling: No
Supported Operating Modes:
120V, 2-wire, Single Phase
120/240V, 3-wire, Single Phase
120/208V, 4-wire, Three Phase
DC
Length: 4 ft - 3 in Height: 2 ft - 8 in
Width: 2 ft - 8 in Weight: 888 lbs
Comments:

Toolbox Item Properties Window, Properties Tab - Generators

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Rating**: Generator rating in kW and Amps Per at rated voltage

Note: If a power factor of 0.8 is assumed for all generators (see Options), then all generator power will be displayed in kVA rather than kW.

- **Operating Voltage:** The phase-to-neutral (AC) or DC voltage of the generator
- **Supports Paralleling**: Indicates whether the generator may be paralleled with other generators.
- **Supported Operating Modes**: Indicates which of the three generator operating modes are supported by this generator.
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*

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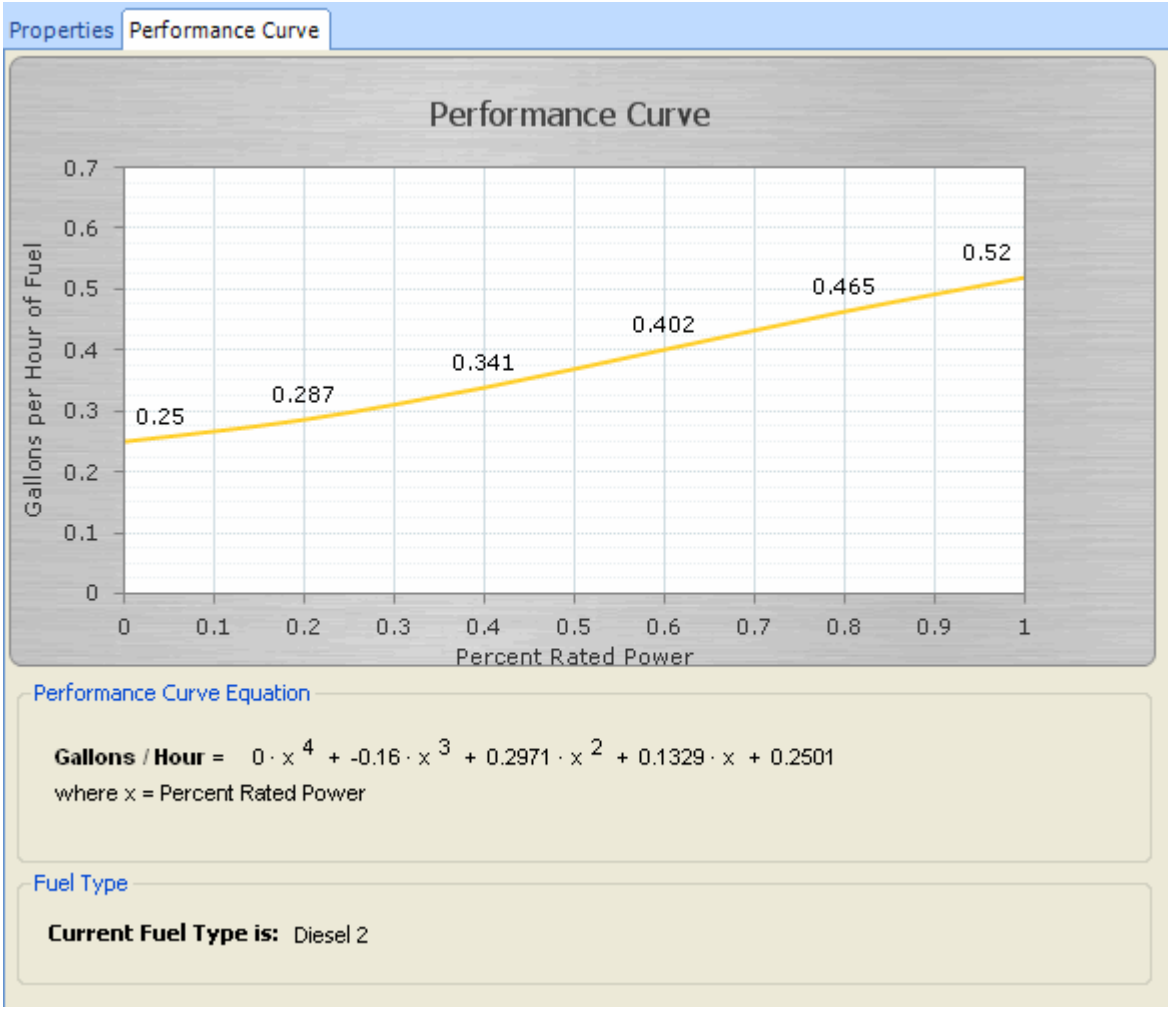
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Performance Curve** tab provides the ability to modify the performance curve of the generator. See Performance Curve for more information about how Performance Curves are used in AutoDISE.



Performance Curve Tab

When editing the current generator, the Performance Curve Equation section **Edit** button appears and a link appears in the Fuel Type section labelled **Change Fuel Type to JP-8**:

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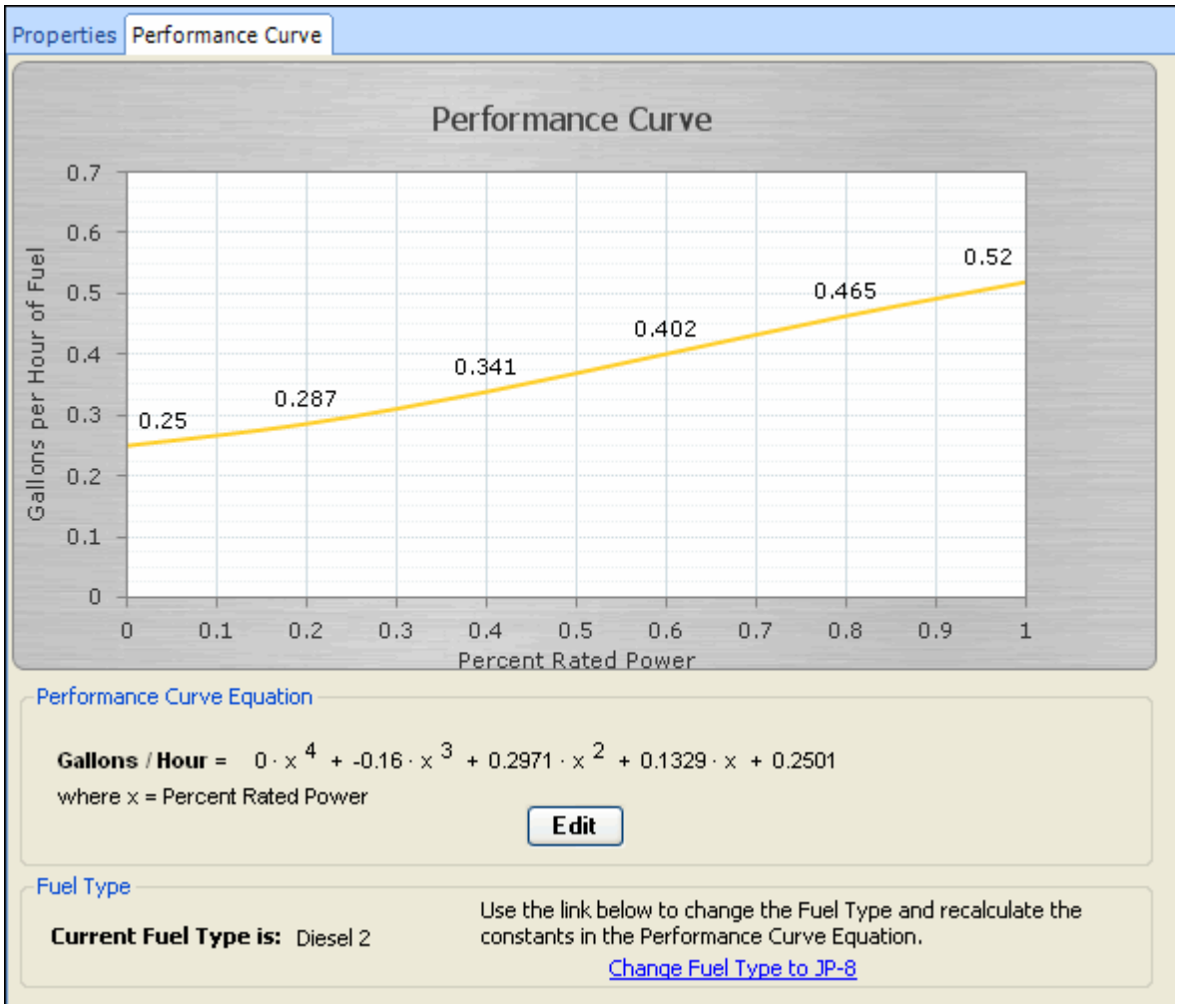

Performance Curve Tab while editing item

- **Edit Button** - Click the button to edit the Performance Curve Equation.
- **Change Fuel Type to JP-8** - Click this link to automatically change the fuel type used in the Performance Curve Equation. Changing the fuel type in this manner recalculates the Performance Curve Equation constants based on the relative difference between JP-8 and Diesel 2 fuels. To change the fuel type without this recalculation, click the **Edit** button instead.

Clicking the **Edit** button in the Performance Curve Equation section puts the tab in edit mode:

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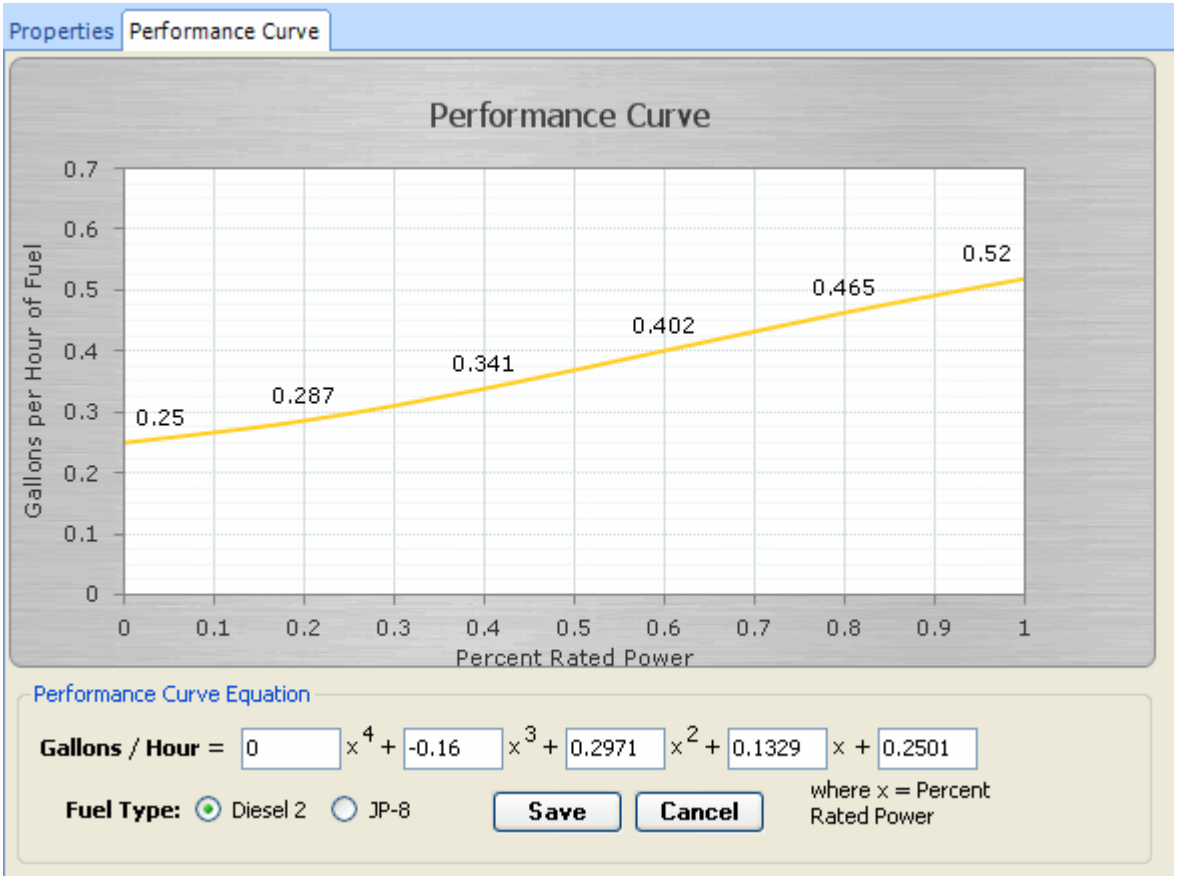

Performance Curve Tab in edit mode

While in edit mode, enter new Performance Curve Equation constants values and change the fuel type. Click the **Save** button to save changes or click **Cancel** to exit edit mode without saving.

13.1.2 Distribution Equipment

The **Toolbox Item Properties** window for distribution equipment has two tabs:

- Properties
- Output Connections

The **Properties** tab of the **Toolbox Item Properties** window for distribution equipment is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

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Toolbox Item Properties Window, Properties Tab - Distribution Equipment

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in Amps at rated voltage
- **Input Connection Name**: Nameplate name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Input Type:** The connector type of the input connection
- **Additional Inputs:** Lists additional inputs available on item (this section is not shown if no additional inputs exist)
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Output Connections** tab of the **Toolbox Item Properties** window for distribution equipment is shown below. This tab lists all output connections and connection properties for the distribution equipment.

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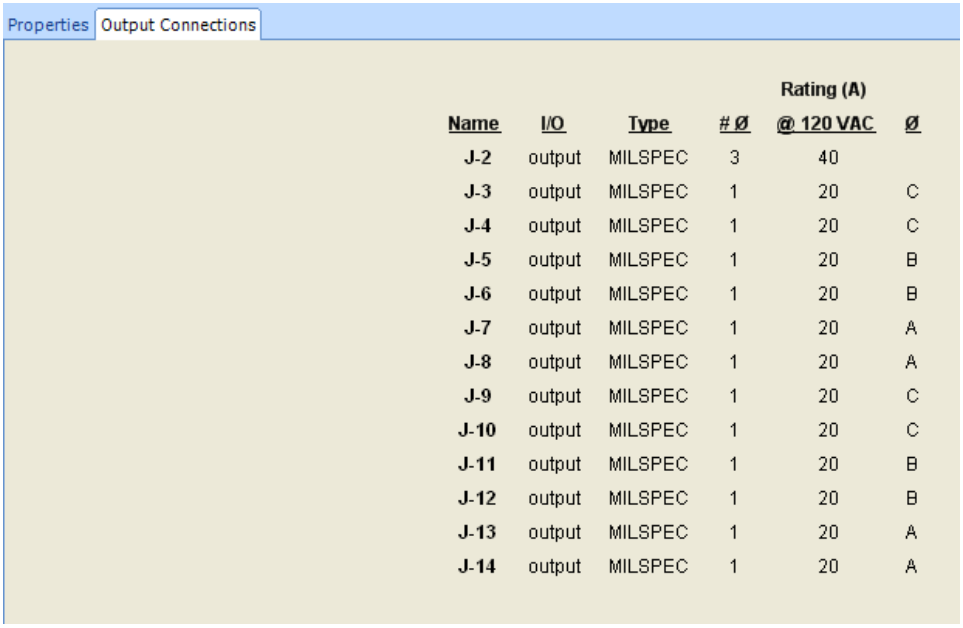


Name	I/O	Type	# Ø	Rating (A) @ 120 VAC	Ø
J-2	output	MILSPEC	3	40	
J-3	output	MILSPEC	1	20	C
J-4	output	MILSPEC	1	20	C
J-5	output	MILSPEC	1	20	B
J-6	output	MILSPEC	1	20	B
J-7	output	MILSPEC	1	20	A
J-8	output	MILSPEC	1	20	A
J-9	output	MILSPEC	1	20	C
J-10	output	MILSPEC	1	20	C
J-11	output	MILSPEC	1	20	B
J-12	output	MILSPEC	1	20	B
J-13	output	MILSPEC	1	20	A
J-14	output	MILSPEC	1	20	A

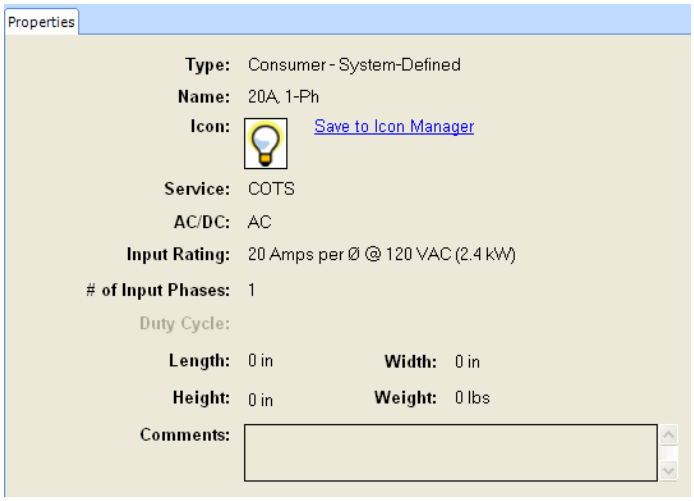
Toolbox Item Properties Window, Output Connections Tab - Distribution Equipment

- **Name:** Nameplate name of the output connection
- **I/O:** Whether the output connection is input or output
- **Type:** Connector Type of the output connection
- **# ∅:** Number of phases of the output connection
- **Rating:** Rating of the output connection in Amps at the rated voltage
- ∅ The nameplate phase of the output connection

13.1.3 Consumers

The **Properties** tab of the **Toolbox Item Properties** window for consumers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

AC Consumers



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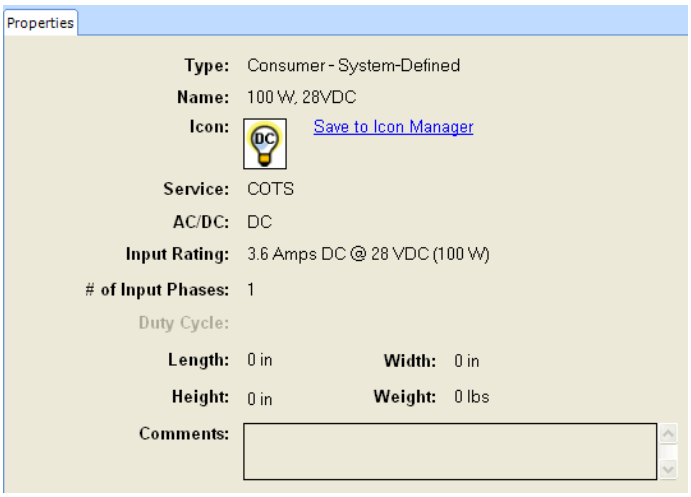
Toolbox Item Properties Window, Properties Tab - AC Consumers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **AC/DC:** Indicates whether the consumer is AC or DC.
- **Input Rating**: Item input rating in Amps per phase and kW at rated voltage
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

DC Consumers



Toolbox Item Properties Window, Properties Tab - DC Consumers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **AC/DC:** Indicates whether the consumer is AC or DC.
- **Input Rating**: Item input rating in Amps DC and Watts at rated voltage
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

13.1.4 Transformers

The **Properties** tab of the **Toolbox Item Properties** window for transformers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the

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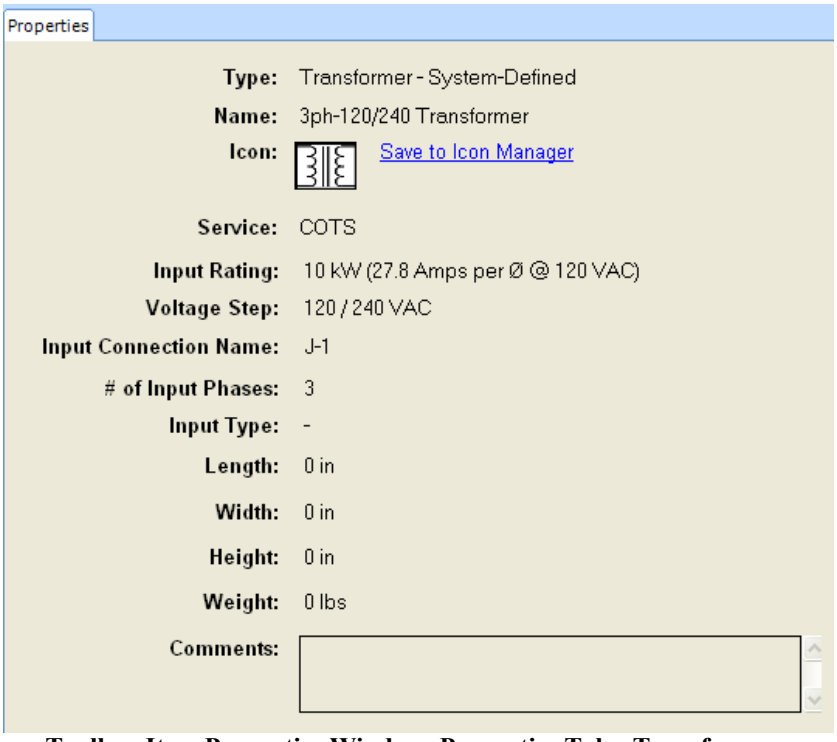
window (not shown below).



Toolbox Item Properties Window, Properties Tab - Transformers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Transformer rating in kW and Amps per phase at input voltage
- **Voltage Step:** The input and output voltages
- **Input Connection Name**: Nameplate name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

13.1.5 DC Rectifiers

The **Properties** tab of the **Toolbox Item Properties** window for DC rectifiers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

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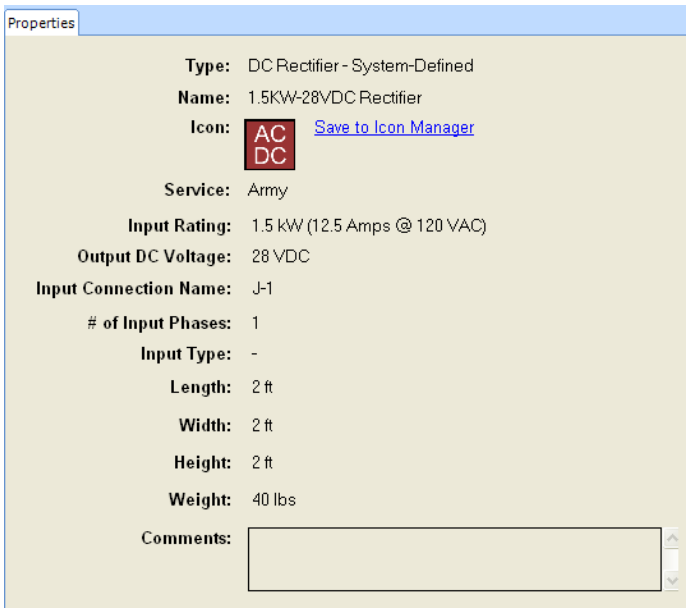

Toolbox Item Properties Window, Properties Tab - DC Rectifiers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in kilowatts (kW) and Amps AC at rated VAC
- **Output DC Voltage:** The voltage of all DC output connections
- **Input Connection Name**: Name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item.

13.1.6 Inverters

The **Properties** tab of the **Toolbox Item Properties** window for inverters is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

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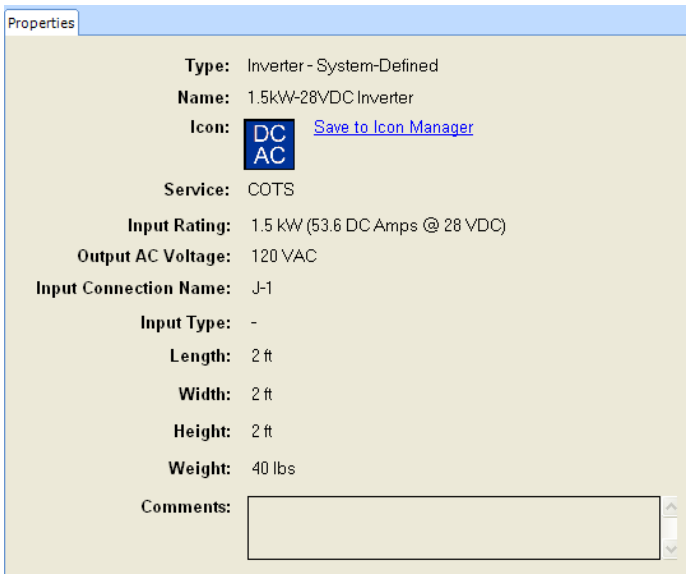

Toolbox Item Properties Window, Properties Tab - Inverters

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in kilowatts (kW) and Amps DC at rated VDC
- **Output AC Voltage:** The voltage of all AC output connections
- **Input Connection Name**: Name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

13.1.7 Shelters/Tents

The **Toolbox Item Properties** window for shelters/tents has three tabs:

- Properties
- Equipment In Shelter
- Icon Framework

The **Properties** tab of the **Toolbox Item Properties** window for shelters/tents is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

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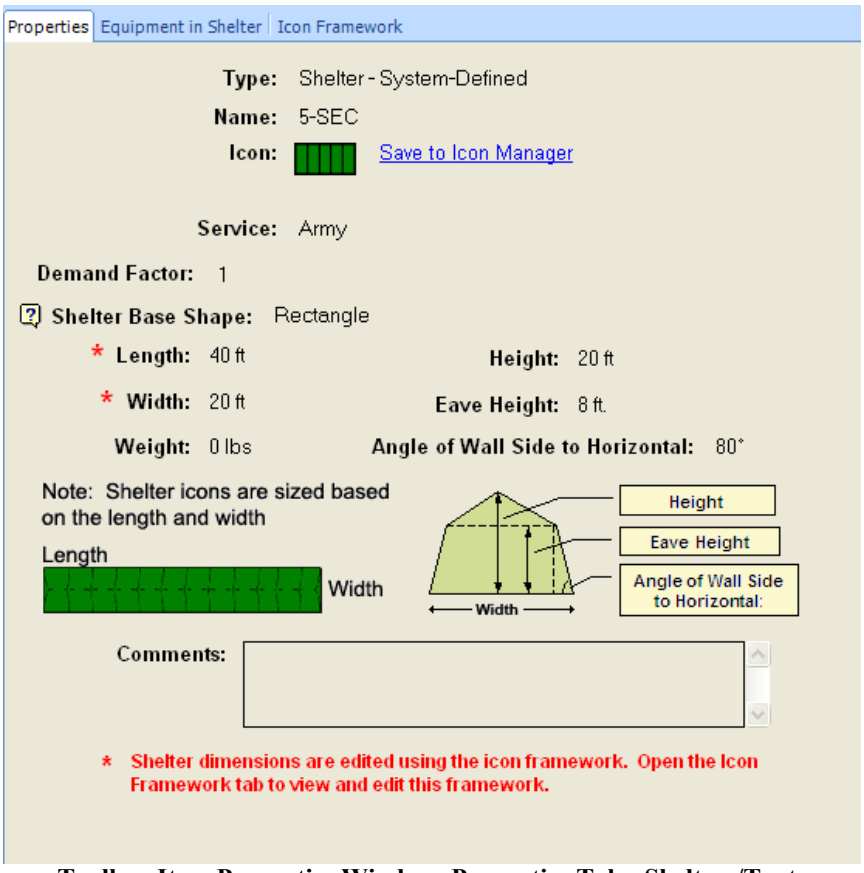

Toolbox Item Properties Window, Properties Tab - Shelters/Tents

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Demand Factor**: The demand factor for the shelter.
- **Length**: Item length, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Width**: Item width, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Shelter Base Shape**: The base shape of the shelter
- **Height**: Shelter height, in feet, from the ground to the tallest point on the shelter. See image below.
- **Eave Height**: Height, in feet, from the ground to the top of the wall side See image below.
- **Angle of Wall Side to Horizontal**: The angle between the horizontal ground and the wall side See image below.
- **Comments**: Any miscellaneous comments made about this item

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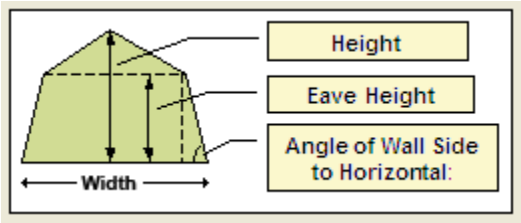

Height, Eave Height and Angle of Wall Side to Horizontal

Note: ***If the Shelter Base Shape is set to Rectangular Dome, then the Eave Height and Angle of Wall Side to Horizontal have no meaning and will be disabled.***

The **Equipment in Shelter** tab of the **Toolbox Item Properties** window for shelters/tents is shown below. This tab lists all equipment residing in the shelter.

Properties | Equipment in Shelter | Icon Framework

Type	Item	Quantity	# Ø	Rating (A)	Voltage
DISE	M40-OPS	1	3	40	120 VAC
DISE	M40-OPS (1)	1	3	40	120 VAC
DISE	M46-DoubleDuplex	3	1	20	120 VAC
DISE	M46-DoubleDuplex (1)	1	1	20	120 VAC
DISE	M46-DoubleDuplex (10)	3	1	20	120 VAC
DISE	M46-DoubleDuplex (3)	1	1	20	120 VAC
DISE	M46-DoubleDuplex (4)	1	1	20	120 VAC
DISE	M46-DoubleDuplex (5)	1	1	20	120 VAC
DISE	M46-DoubleDuplex (7)	1	1	20	120 VAC
DISE	M46-DoubleDuplex (8)	1	1	20	120 VAC
DISE	M46-DoubleDuplex (9)	1	1	20	120 VAC
Breaker Panel	Connector	1	1	20	120 VAC
Breaker Panel	Connector (1)	1	1	20	120 VAC
Breaker Panel	Connector (2)	2	1	20	120 VAC
Breaker Panel	Connector (3)	2	1	20	120 VAC
Breaker Panel	PDU-Comm	1	3	40	120 VAC
Consumer	AIS	1	1	2.5	120 VAC
Consumer	CAU	1	1	2	120 VAC
Consumer	CAU (1)	1	1	2	120 VAC

Toolbox Item Properties Window, Equipment in Shelter Tab - Shelters/Tents

- **Type:** Type of equipment (generator, consumer, distribution, etc)
- **Item:** Name of equipment
- **Quantity:** Number of pieces of equipment with this name, rating and number of phases
- **# ∅:** Number of phases of the equipment's input connection
- **Rating:** Rating of the equipment input connection in Amps

The **Icon Framework** tab allows the user to view the current icon framework, as well as access the Icon Framework Editor. See Icon Framework Tab for more information.

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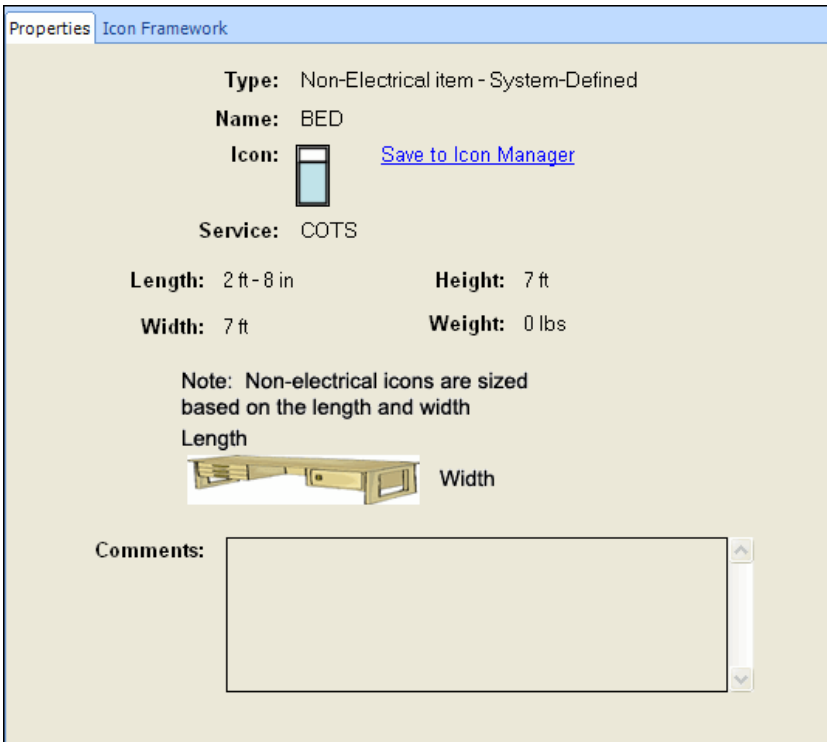
13.1.8 Non-Electrical Equipment

The **Properties** tab of the **Toolbox Item Properties** window for non-electrical equipment is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).



Toolbox Item Properties Window, Properties Tab - Non-electrical Equipment

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Length**: Item length, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Width**: Item width, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Icon Framework** tab allows the user to view the current icon framework, as well as access the Icon Framework Editor. See Icon Framework Tab for more information.

13.2 Adding Equipment to the ToolBox

To add new user-defined equipment to the Toolbox, simply select **Add New Item to Toolbox** from the Toolbox menu and then select which item it is you wish to add from the submenu that appears.

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A window will appear for adding your specified item type.

See Adding Generators, Adding Consumers, Adding Transformers, Adding DC Rectifiers, Adding Inverters, Adding Distribution Equipment, Adding Non-Electrical Items, and Adding Shelters/Tents.

Alternative Method

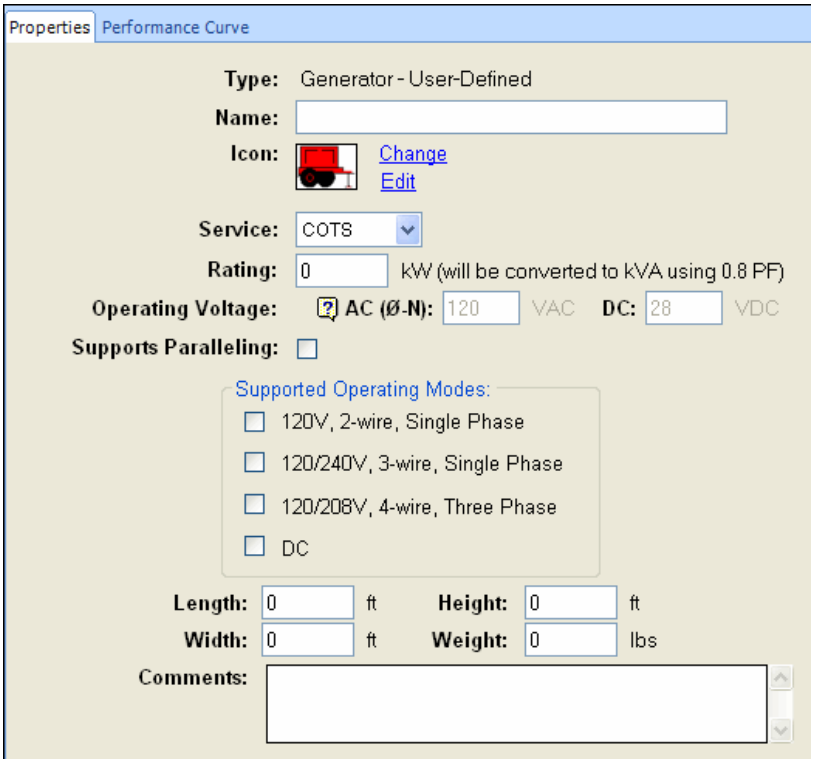
A second method for adding user-defined items to the Toolbox is to add a system-defined item to a layout, modify it's properties, then right-click on the item and select **Save Item to Toolbox**.

For shelters, this method also saves all internal items and links, ***except for links between paralleled generators and distribution items and the communication links between paralleled generators.***

13.2.1 Toolbox - Add New Generator

The **Toolbox - Add New Generator** window is used to add a new generator as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Properties** tab of the **Toolbox - Add New Generator** window is shown below.



Toolbox - Add New Generator Window, Properties Tab

- **Name:** The name of the item

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- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Rating**: Generator rating in kW

Note: If a power factor of 0.8 is assumed for all generators then the power in kW that is entered will be converted to apparent power and displayed in kVA once the new generator is saved to the Toolbox.

- **Operating Voltage:** The AC and/or DC operating voltage of the generator. The AC field will only be activated if one of the non-DC operating modes is checked, and the DC field will only be activated if the DC operating mode is checked.
- **Supports Paralleling**: Indicates whether the generator may be paralleled with other generators.
- **Supported Operating Modes**: Indicates which of the four generator operating modes are supported by this generator.
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Performance Curve** tab provides the ability to modify the performance curve of the generator. See Performance Curve for more information about how Performance Curves are used in AutoDISE.

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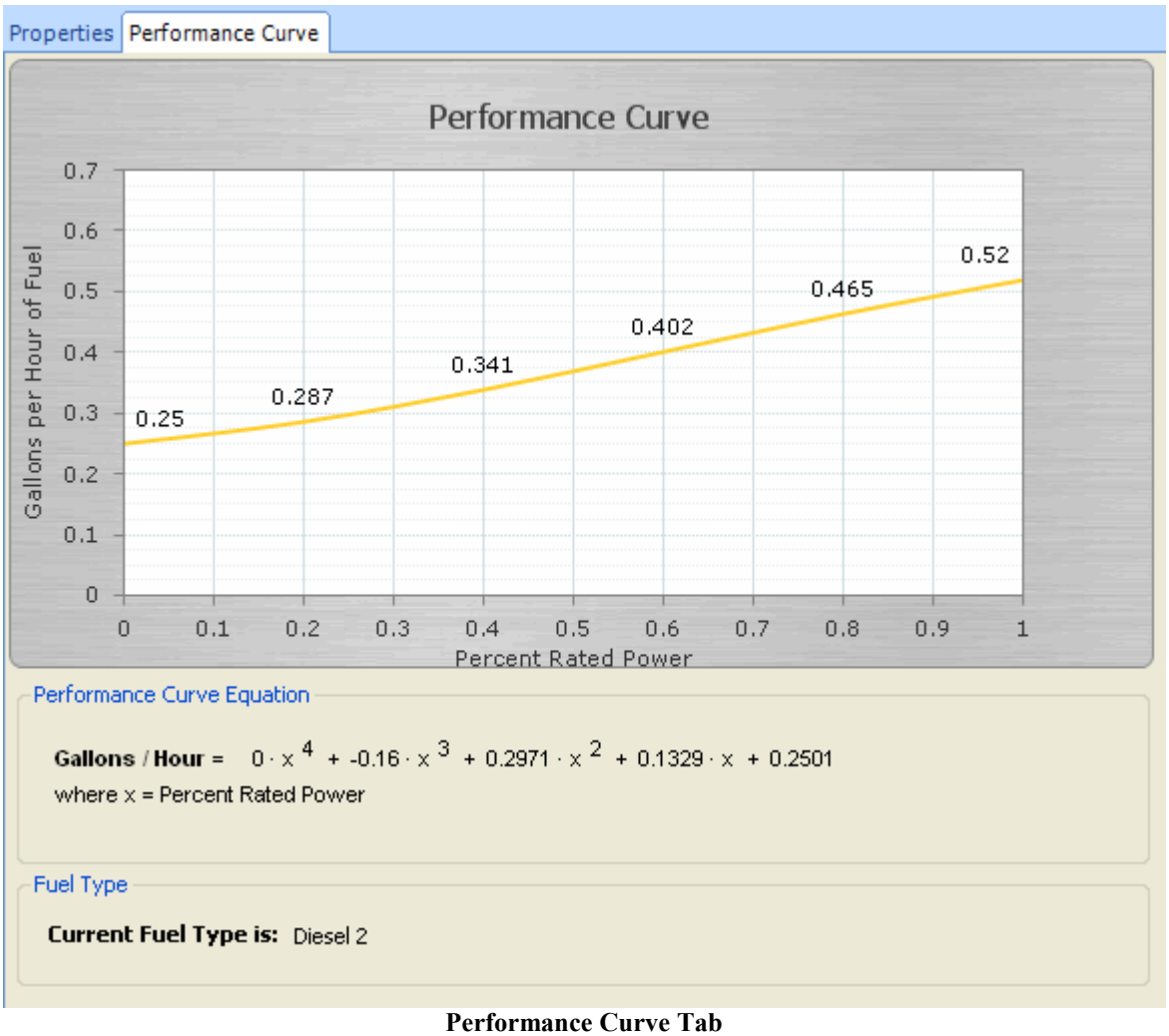

Performance Curve Tab

When editing the current generator, the Performance Curve Equation section **Edit** button appears and a link appears in the Fuel Type section labelled **Change Fuel Type to JP-8**:

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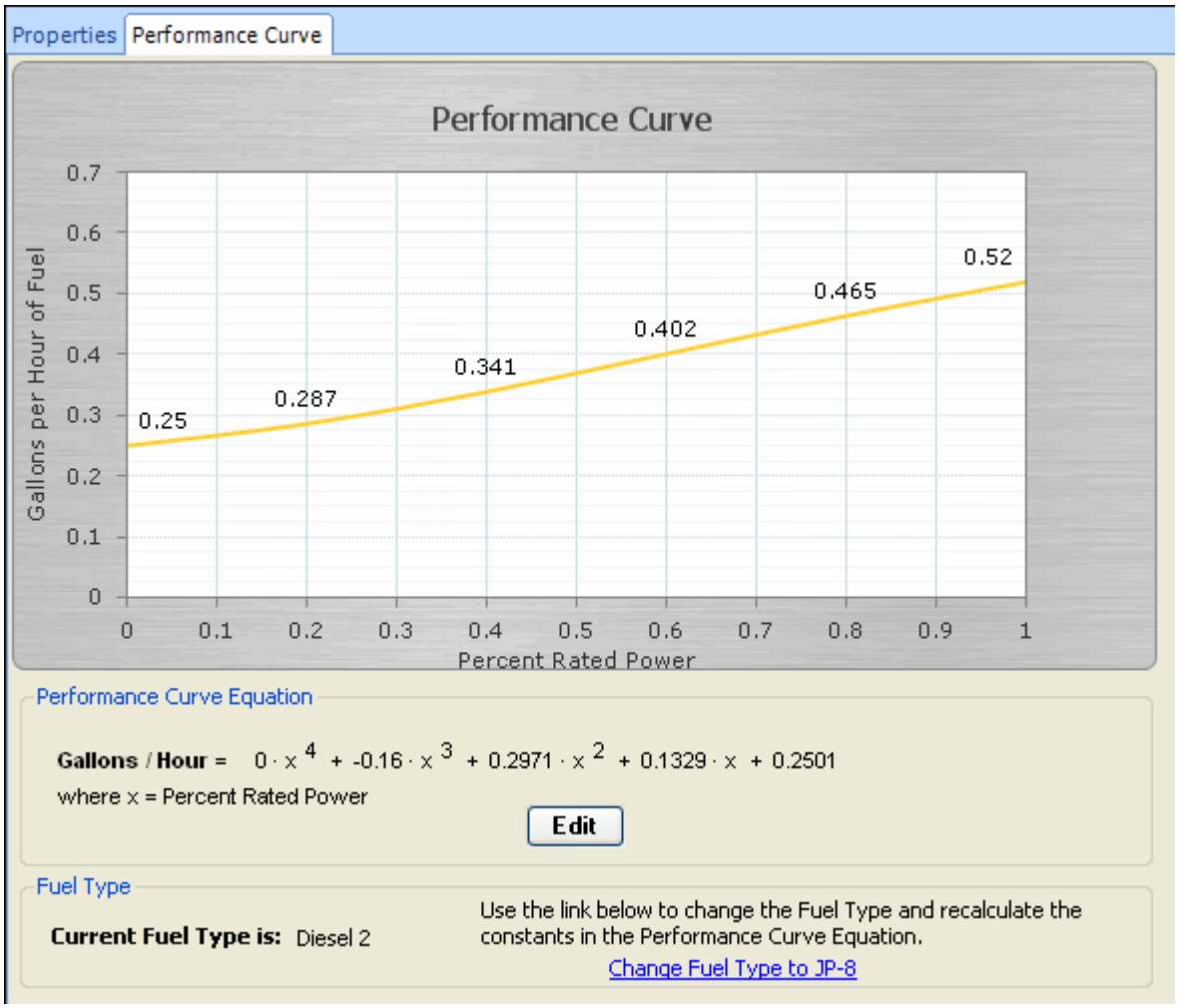

Performance Curve Tab while editing item

- **Edit Button** - Click the button to edit the Performance Curve Equation.
- **Change Fuel Type to JP-8** - Click this link to automatically change the fuel type used in the Performance Curve Equation. Changing the fuel type in this manner recalculates the Performance Curve Equation constants based on the relative difference between JP-8 and Diesel 2 fuels. To change the fuel type without this recalculation, click the **Edit** button instead.

Clicking the **Edit** button in the Performance Curve Equation section puts the tab in edit mode:

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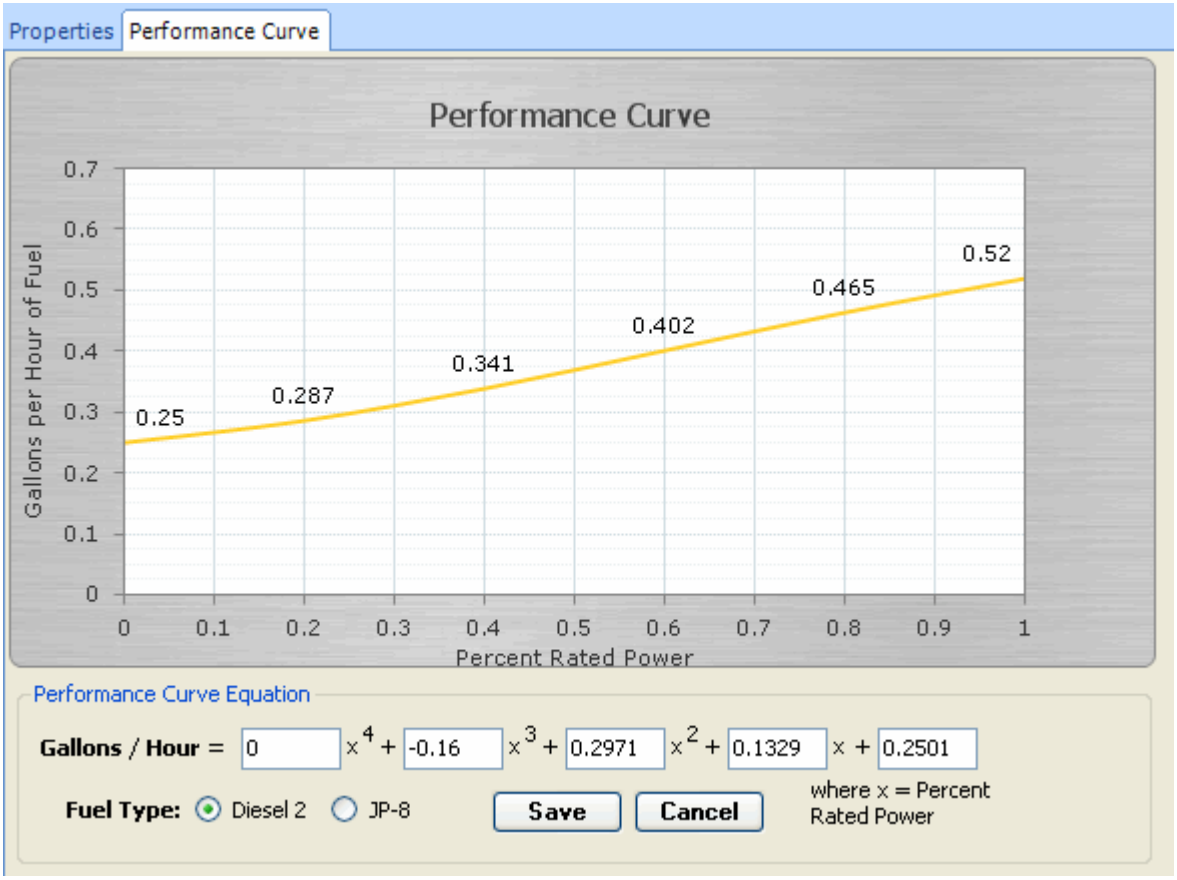

Performance Curve Tab in edit mode

While in edit mode, enter new Performance Curve Equation constants values and change the fuel type. Click the **Save** button to save changes or click **Cancel** to exit edit mode without saving.

13.2.2 Toolbox - Add New Distribution Item

The **Toolbox - Add New Distribution Item** window is used to add a new distribution item as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Toolbox - Add New Distribution Item** window has two tabs:

- Properties
- Output Connections

The **Properties** tab of the **Toolbox - Add New Distribution Item** window is shown below.

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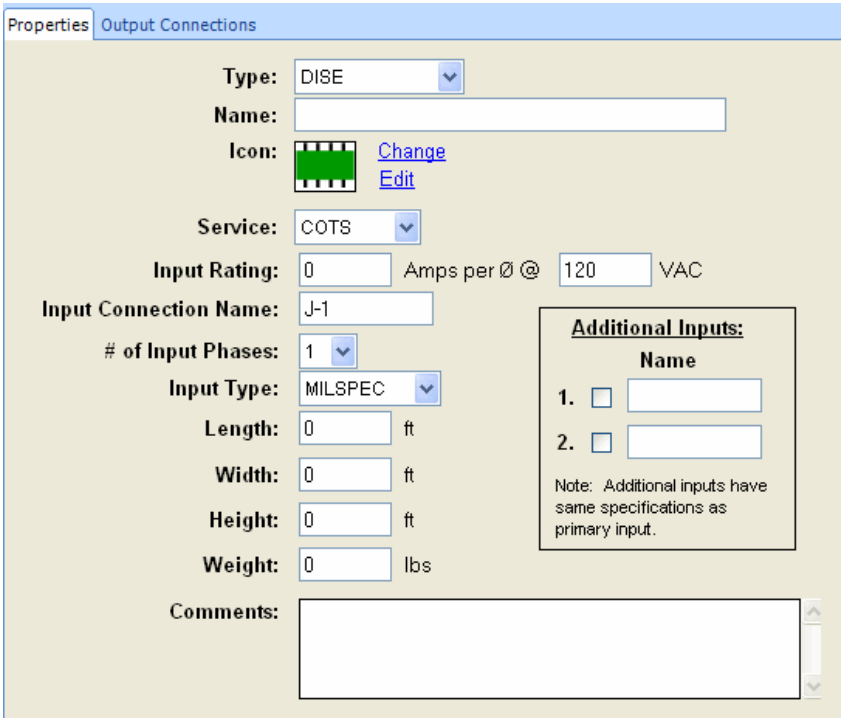

Toolbox - Add New Distribution Item Window, Properties Tab

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in Amps per phase at the specified VAC
- **Input Connection Name**: Nameplate name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Additional Inputs:** Lists additional inputs available on item (this section is not shown if no additional inputs exist)
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Output Connections** tab of the **Toolbox - Add New Distribution Item** window is shown below. This tab allows a user to specify all output connections and connection properties for the distribution item.

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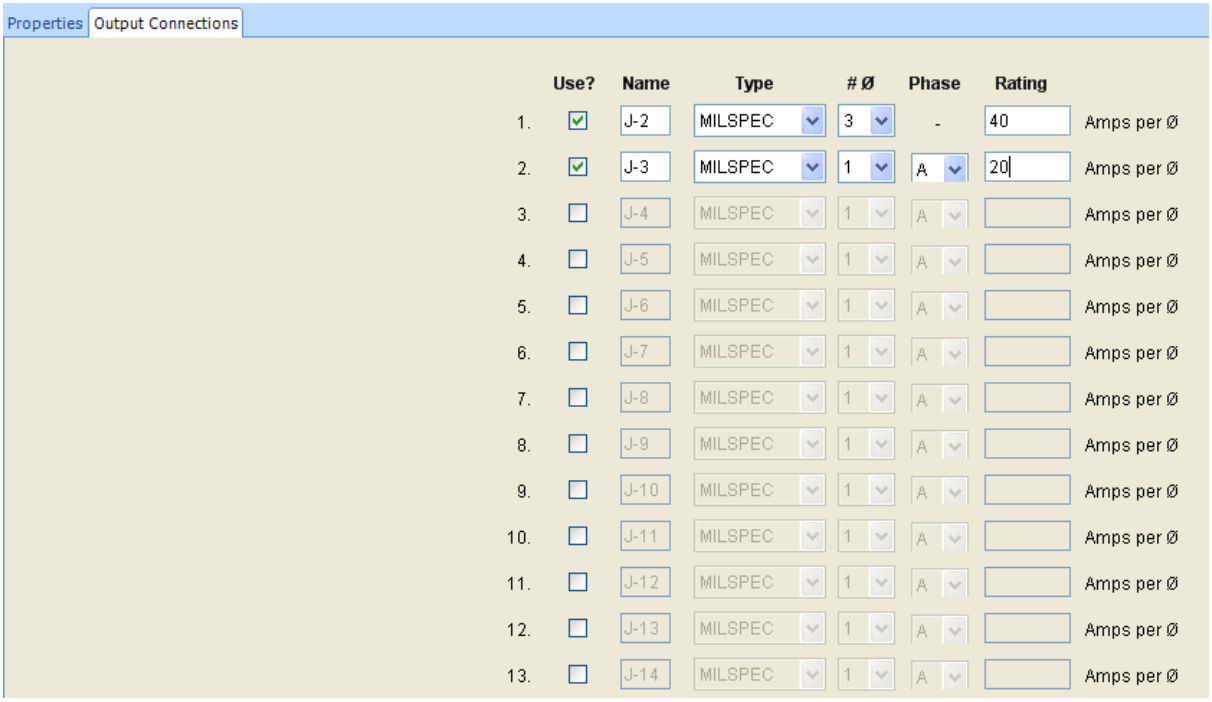
Properties
Output Connections
Use?
Name
Type
Ø
Phase
Rating
1. J-2 MILSPEC 3 - 40 Amps per Ø
2. J-3 MILSPEC 1 A 20 Amps per Ø
3. J-4 MILSPEC 1 A Amps per Ø
4. J-5 MILSPEC 1 A Amps per Ø
5. J-6 MILSPEC 1 A Amps per Ø
6. J-7 MILSPEC 1 A Amps per Ø
7. J-8 MILSPEC 1 A Amps per Ø
8. J-9 MILSPEC 1 A Amps per Ø
9. J-10 MILSPEC 1 A Amps per Ø
10. J-11 MILSPEC 1 A Amps per Ø
11. J-12 MILSPEC 1 A Amps per Ø
12. J-13 MILSPEC 1 A Amps per Ø
13. J-14 MILSPEC 1 A Amps per Ø

Toolbox - Add New Distribution Item Window, Output Connections Tab

- **Name:** Nameplate name of the output connection
- **I/O:** Whether the output connection is input or output
- **Type:** Connector Type of the output connection
- **# ∅:** Number of phases of the output connection
- **Rating:** Rating of the output connection in Amps per phase
- ∅ The nameplate phase of the output connection

13.2.3 Toolbox - Add New Consumer

The **Toolbox - Add New Consumer** window is used to add a new consumer as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Properties** tab of the **Toolbox - Add New Consumer** window is shown below for an AC consumer.

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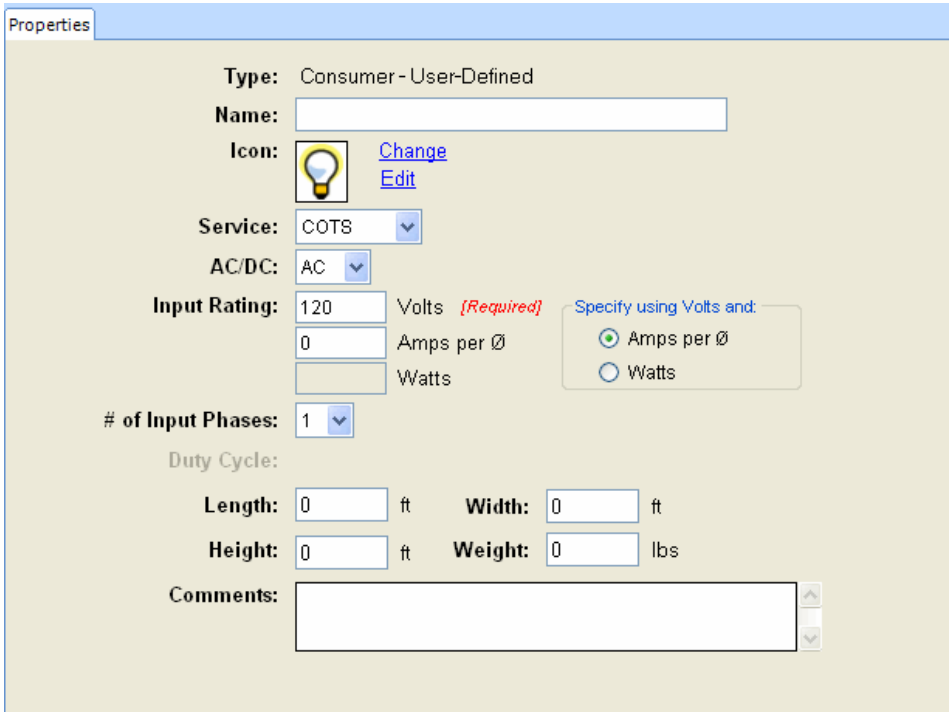

Toolbox - Add New Consumer Window, Properties Tab - AC Consumer

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **AC/DC:** Indicates whether the consumer is AC or DC. See image below for view for DC consumer.
- **Input Rating**: The input rating for consumers may be entered using Amps per phase or using Watts. Select which method to use by clicking the "Specify using Volts and:" radio button, then enter the appropriate values. In either case, the voltage field is required.
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

DC Consumers

If DC is selected from the AC/DC drop-down list, the window options change slightly such that **# of Input Phases** is disabled and set to unity:

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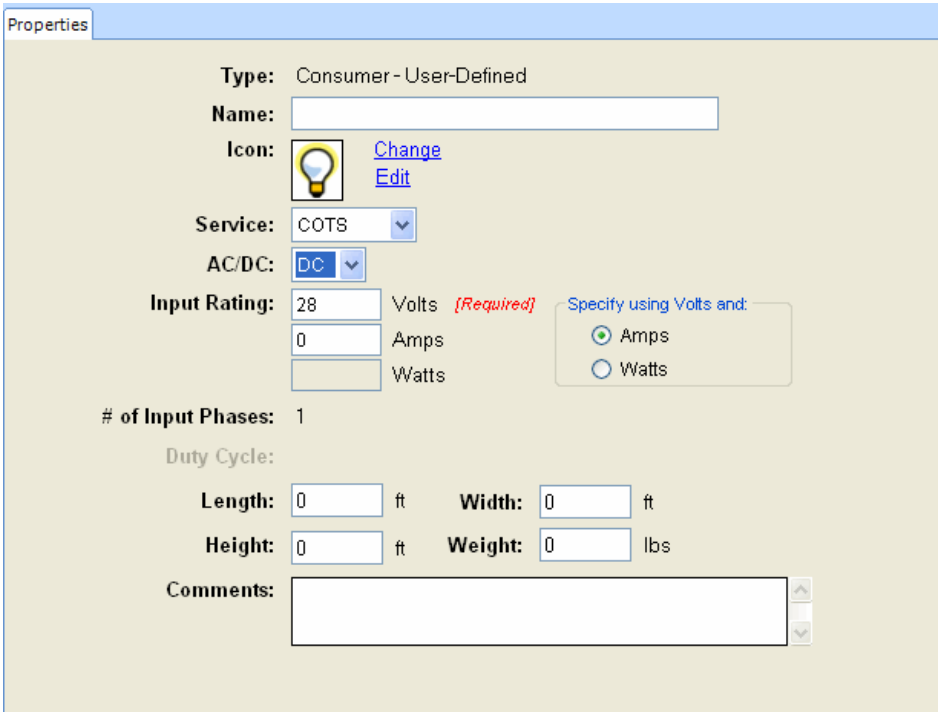

Toolbox - Add New Consumer Window, Properties Tab - DC Consumer

13.2.4 Toolbox - Add New Transformer

The **Toolbox - Add New Transformer** window is used to add a new transformer as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Properties** tab of the **Toolbox - Add New Transformer** window is shown below.

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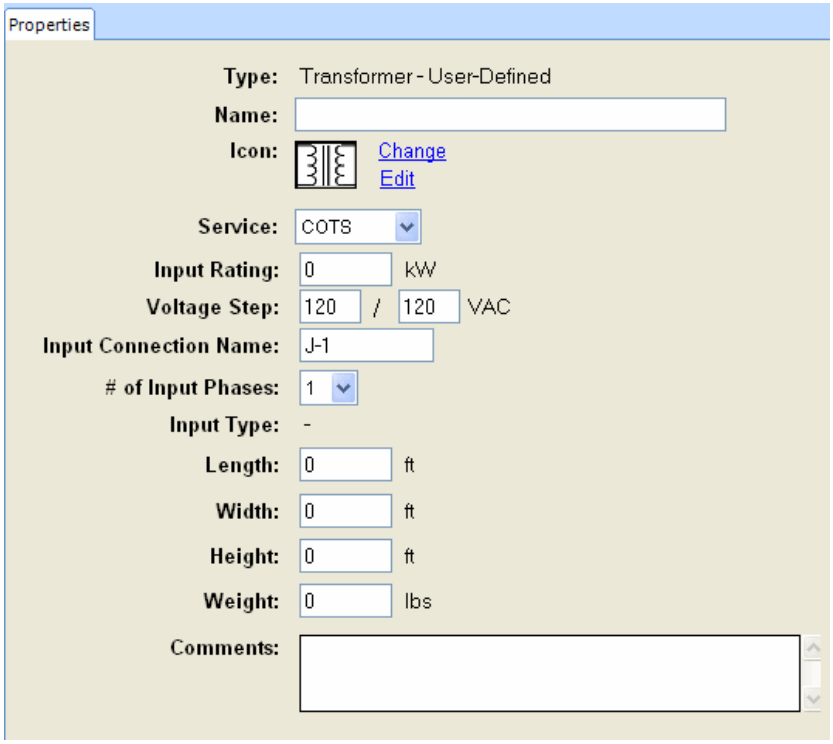

Toolbox - Add New Transformer Window, Properties Tab

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in kilowatts (kW)
- **Voltage Step:** The input and output voltages
- **Input Connection Name**: The name of the input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

13.2.5 Toolbox - Add New DC Rectifier

The **Toolbox - Add New DC Rectifier** window is used to add a new DC rectifier as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Properties** tab of the **Toolbox - Add New DC Rectifier** window is shown below.

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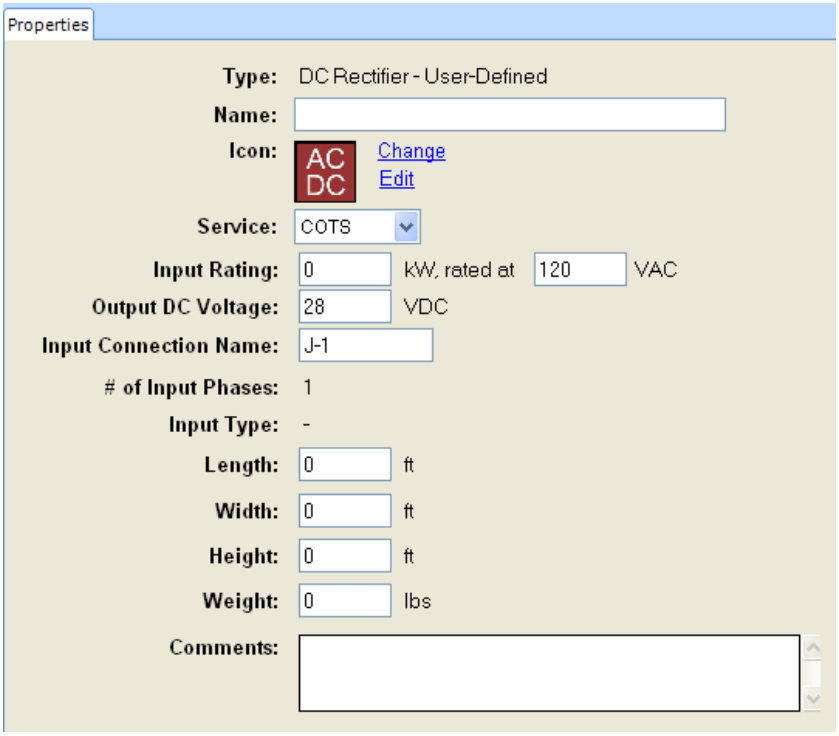

Toolbox - Add New DC Rectifier Window, Properties Tab

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in kilowatts (kW) and rated voltage in VAC
- **Output DC Voltage**: The voltage of all DC output connections
- **Input Connection Name**: The name of the input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item.

13.2.6 Toolbox - Add New Inverter

The **Toolbox - Add New Inverter** window is used to add a new inverter as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Properties** tab of the **Toolbox - Add New Inverter** window is shown below.

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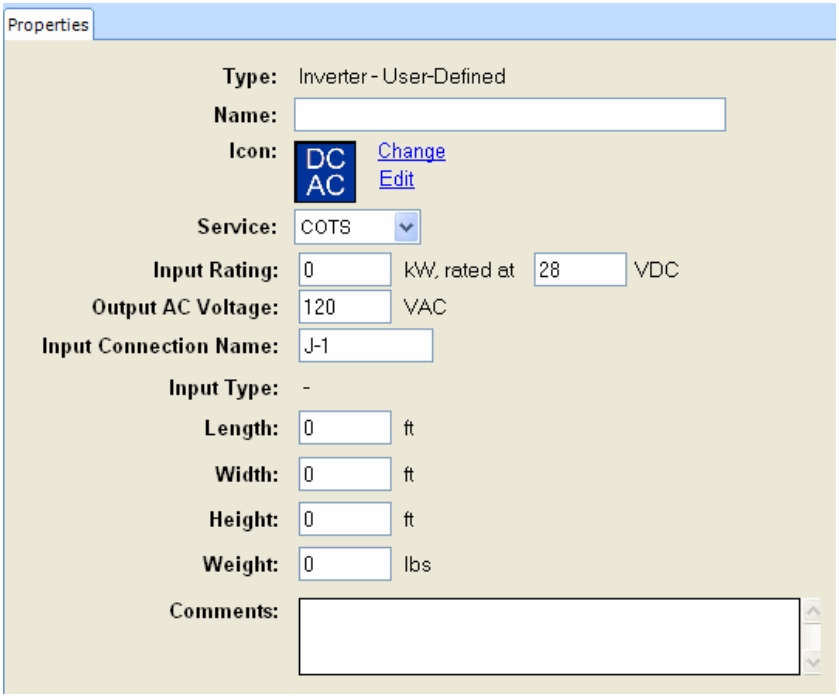

Toolbox - Add New Inverter Window, Properties Tab

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Input Rating**: Item input rating in kilowatts (kW) and rated voltage in VDC
- **Output AC Voltage**: The voltage of all AC output connections
- **Input Connection Name**: The name of the input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

13.2.7 Toolbox - Add New Shelter/Tent

The **Toolbox - Add New Shelter/Tent** window is used to add a new shelter/tent as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Toolbox - Add New Shelter/Tent** window has three tabs:

- Properties
- Equipment in Shelter
- Icon Framework

The **Properties** tab of the **Toolbox - Add New Shelter/Tent** window is shown below.

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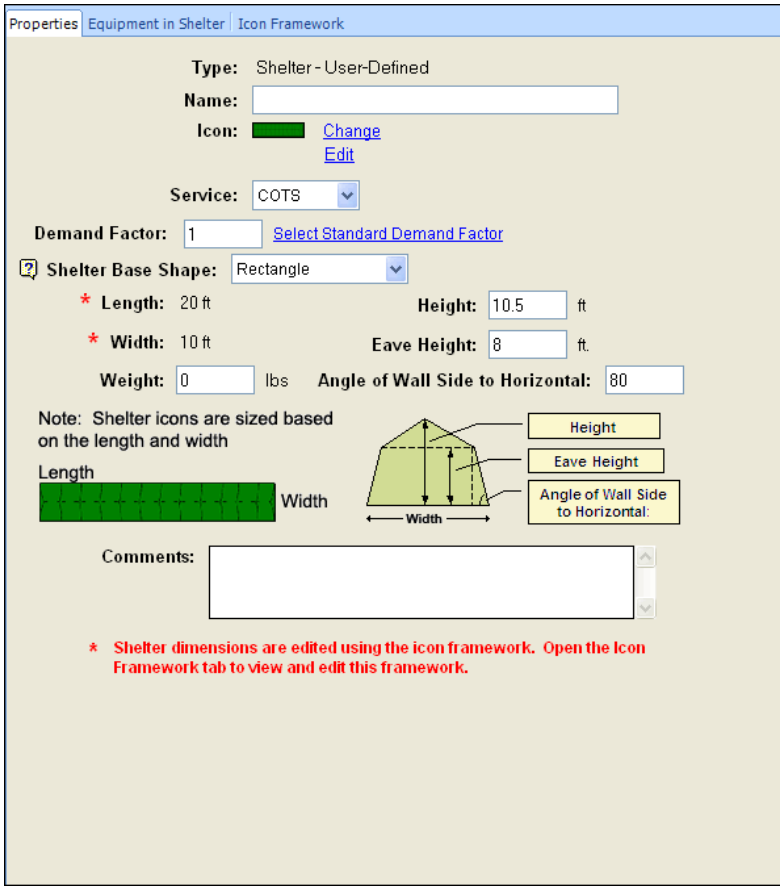

Toolbox - Add New Shelter/Tent Window, Properties Tab

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Demand Factor**: The demand factor for the shelter.
- **Length**: Item length, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Width**: Item width, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Shelter Base Shape**: The base shape of the shelter
- **Height**: Shelter height, in feet, from the ground to the tallest point on the shelter. See image below.
- **Eave Height**: Height, in feet, from the ground to the top of the wall side See image below.
- **Angle of Wall Side to Horizontal**: The angle between the horizontal ground and the wall side See image below.
- **Comments**: Any miscellaneous comments made about this item

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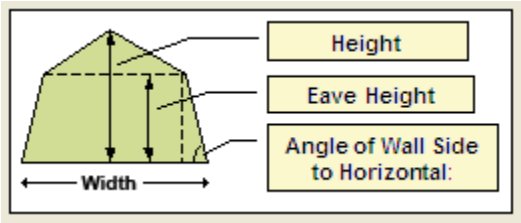
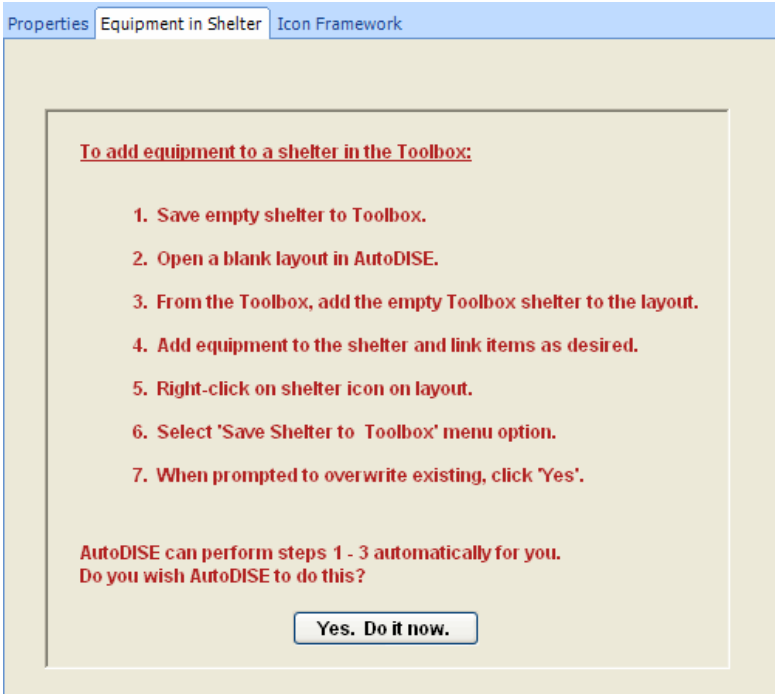


Height, Eave Height and Angle of Wall Side to Horizontal

Note: ***If the Shelter Base Shape is set to Rectangular Dome, then the Eave Height and Angle of Wall Side to Horizontal have no meaning and will be disabled.***

The **Equipment in Shelter** tab of the **Toolbox - Add New Shelter/Tent** window is shown below. This tab is unique in that it does not let the user directly add equipment to shelters using the window. Instead, to allow the user to leverage the tools available in the Main Layout View and to create and save links in the shelter as well as items, the tab requires a user who wishes to add equipment to the new shelter to save the empty shelter, open a new layout, add the new shelter to the layout, add new desired items and links and right-click and select **Save Shelter to Toolbox** from the popup menu that appears.

As a shortcut, AutoDISE will perform three of these steps for the user.


Properties
Equipment in Shelter
Icon Framework
To add equipment to a shelter in the Toolbox:
1. Save empty shelter to Toolbox.
2. Open a blank layout in AutoDISE.
3. From the Toolbox, add the empty Toolbox shelter to the layout.
4. Add equipment to the shelter and link items as desired.
5. Right-click on shelter icon on layout.
6. Select 'Save Shelter to Toolbox' menu option.
7. When prompted to overwrite existing, click 'Yes'.
AutoDISE can perform steps 1 - 3 automatically for you.
Do you wish AutoDISE to do this?
Yes. Do it now.

Toolbox - Add New Shelter/Tent Window, Equipment in Shelter Tab

The **Icon Framework** tab allows the user to view the current icon framework, as well as access the Icon Framework Editor. See Icon Framework Tab for more information.

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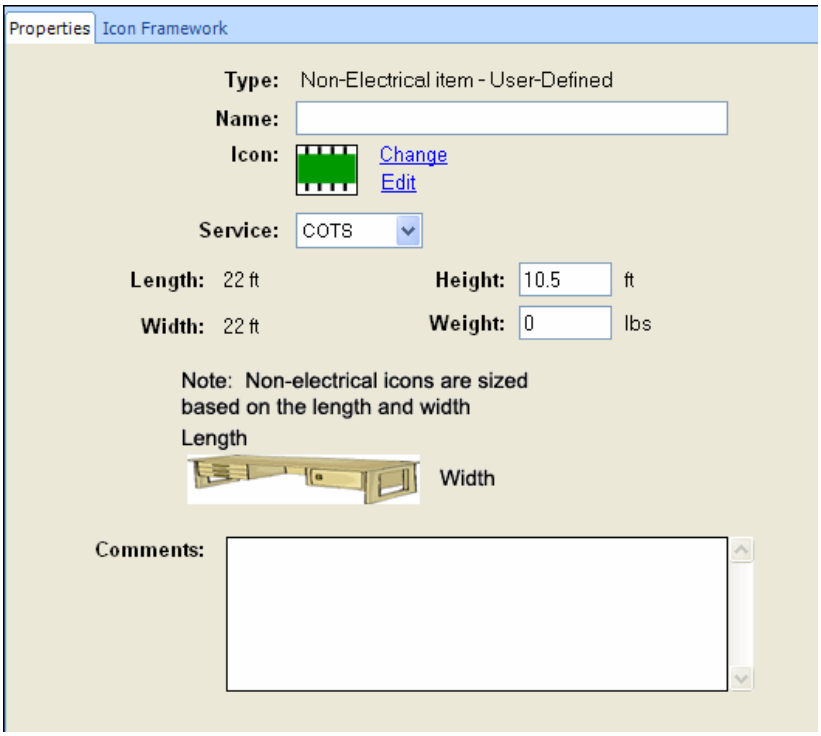
13.2.8 Toolbox - Add New Non-electrical Item

The **Toolbox - Add New Non-electrical Item** window is used to add a new non-electrical item as a user-defined item in the Toolbox. Fill in the desired fields and click **Save.**

The **Properties** tab of the **Toolbox - Add New Non-electrical Item** window is shown below.



Toolbox - Add New Non-electrical Item Window, Properties Tab

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Length**: Item length, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Width**: Item width, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Icon Framework** tab allows the user to view the current icon framework, as well as access the Icon Framework Editor. See Icon Framework Tab for more information.

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13.3 Editing Equipment in the ToolBox

User-defined equipment in the Toolbox may be edited. This can be done in one of three ways:

1. Open up the Toolbox and right-click on the desired item. Select **Properties** from the menu that appears. The Toolbox Item Properties window appears. See Toolbox Item Properties for information on the fields to edit for particular pieces of equipment.

2. Select **View Toolbox Items** from the Toolbox menu. The Toolbox Item Properties window appears. Click on the left side of the window to select the toolbox item you wish to edit. See Toolbox Item Properties for information on the fields to edit for particular pieces of equipment.

3. Add a Toolbox Item to a layout, modify the item then right-click on the item and select **Save Item to Toolbox** from the menu that appears. If the name of the item is identical to the name of an item already in the Toolbox, regardless of type, AutoDISE will prompt the user for whether they wish to overwrite the existing item. To save an item as a new item the user must give the item a unique name prior to saving.

   Note: Method 3 is of the most practical use for shelters and tents. This method allows a user to modify the contents of a shelter, including links, and then save the shelter and contents directly into the Toolbox.

13.4 Layout Item Properties

To view the properties of an item on a layout, either:

1. Right-click on the desired item and select **Properties** from the popup menu that appears, OR

2. Select **View Items** from the Layout Menu.

This opens the **Layout Item Properties** window. Select the desired item from the list on the left to see the item properties on the right.

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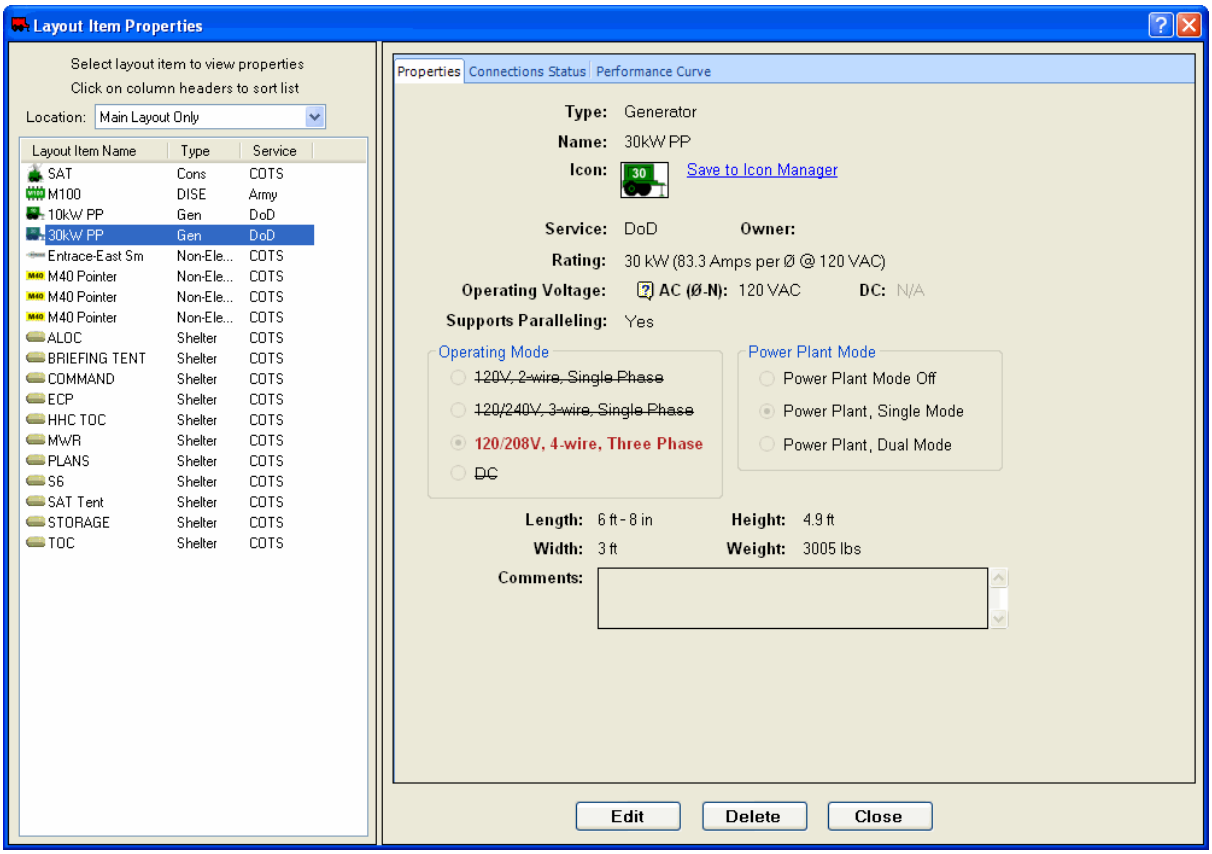

Layout Item Properties Window

See Layout Item Properties for:

- Generators
- Distribution Equipment
- Consumers
- Transformers
- DC Rectifiers
- Inverters
- Non-electrical Equipment
- Shelter/Tents

13.4.1 Generators

The **Layout Item Properties** window for generators has two tabs:

- Properties
- Connections Status

The **Properties** tab of the **Layout Item Properties** window for generators is shown below. Items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

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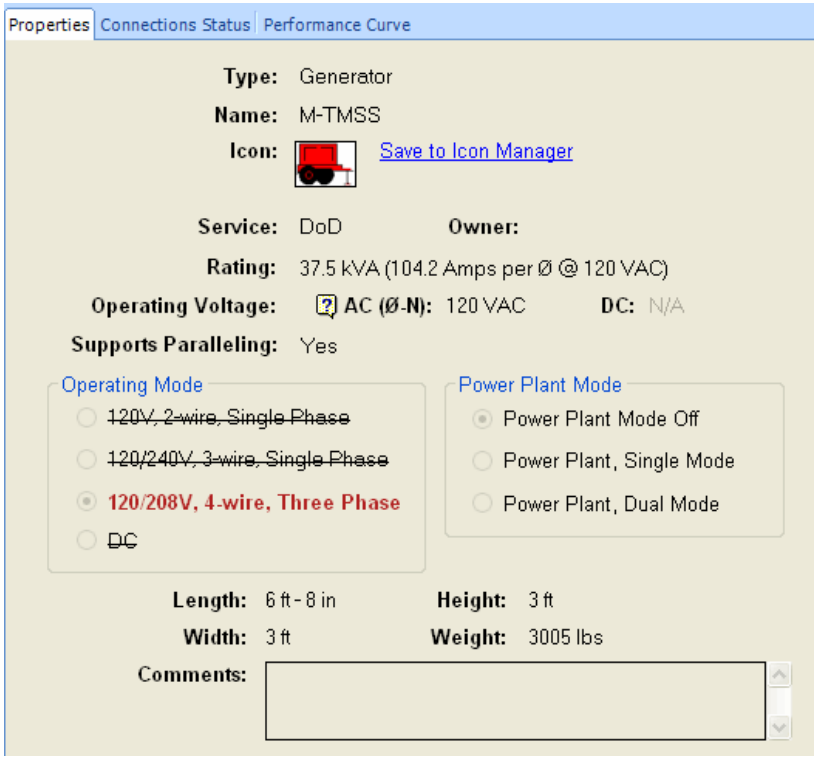

Layout Item Properties Window, Properties Tab - Generators

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **Rating**: Generator rating in kW and Amps Per at rated voltage

Note: If a power factor of 0.8 is assumed for all generators (see Options), then all generator power will be displayed in kVA rather than kW.

- **Operating Voltage:** The phase-to-neutral (AC) or DC voltage of the generator
- **Supports Paralleling**: Indicates whether the generator may be paralleled with other generators.
- **Operating Mode**: Indicates which of the four generator operating modes the generator is currently in.
- **Power Plant Mode:** Indicates the Power Plant Mode status of the generator
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Connections Status** tab of the **Layout Item Properties** window for generators is shown

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below.

Properties
Connections Status
Performance Curve
Generator: M-TMSS
Rating: 37.5 kVA (104.2 Amps per Ø @ 120 VAC)
Connected Loads:
Phase Loads
Device Loc # Ø A B C Rotation
DISE 2-Duplex (9) (in shelter C3 - Maneu... A 1 3.8 0 0
M100-1 (1) A 3 12.5 0 14.6
Total Phase Loads: 16.2 0 14.6
Demand Loads:
Phase Loads
Device Loc # Ø A B C Rotation
DISE 2-Duplex (9) (in shelter C3 - Maneu... A 1 2.6 0 0
M100-1 (1) A 3 8.8 0 10.2
Total Phase Loads: 11.4 0 10.2

Layout Item Properties Window, Properties Tab - Connections Status

- **Device:** The name of each item directly connected to the generator
- **Loc:** The connection location of each item to the generator
- **# ∅:** The number of phases of the connected item
- **Phase Loads:** The phase load on each phase of the generator, in Amps
- **Rotation:** The phase rotation at the item connection to the generator

The **Performance Curve** tab provides the ability to modify the performance curve of the generator. See Performance Curve for more information about how Performance Curves are used in AutoDISE.

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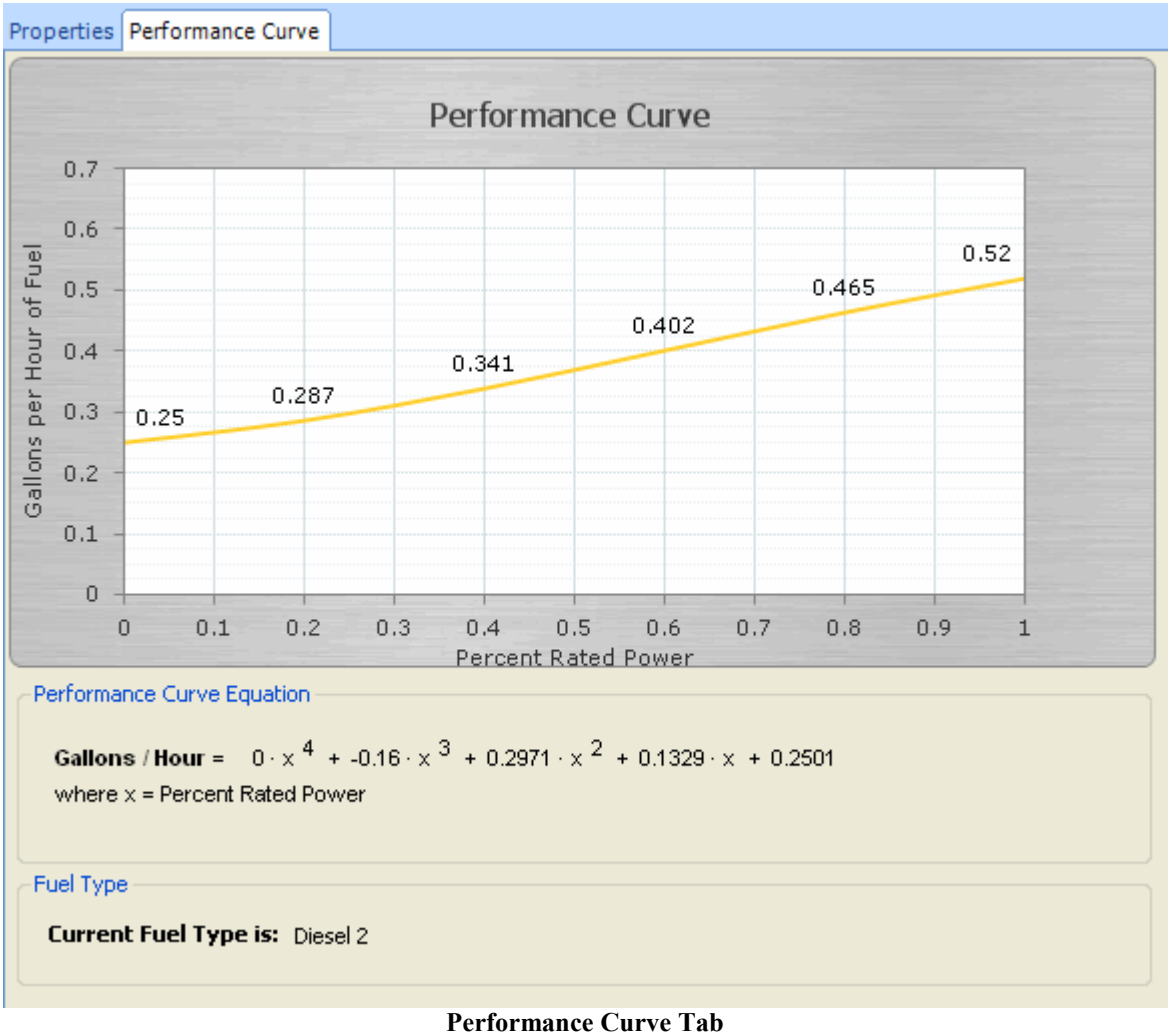

Performance Curve Tab

When editing the current generator, the Performance Curve Equation section **Edit** button appears and a link appears in the Fuel Type section labelled **Change Fuel Type to JP-8**:

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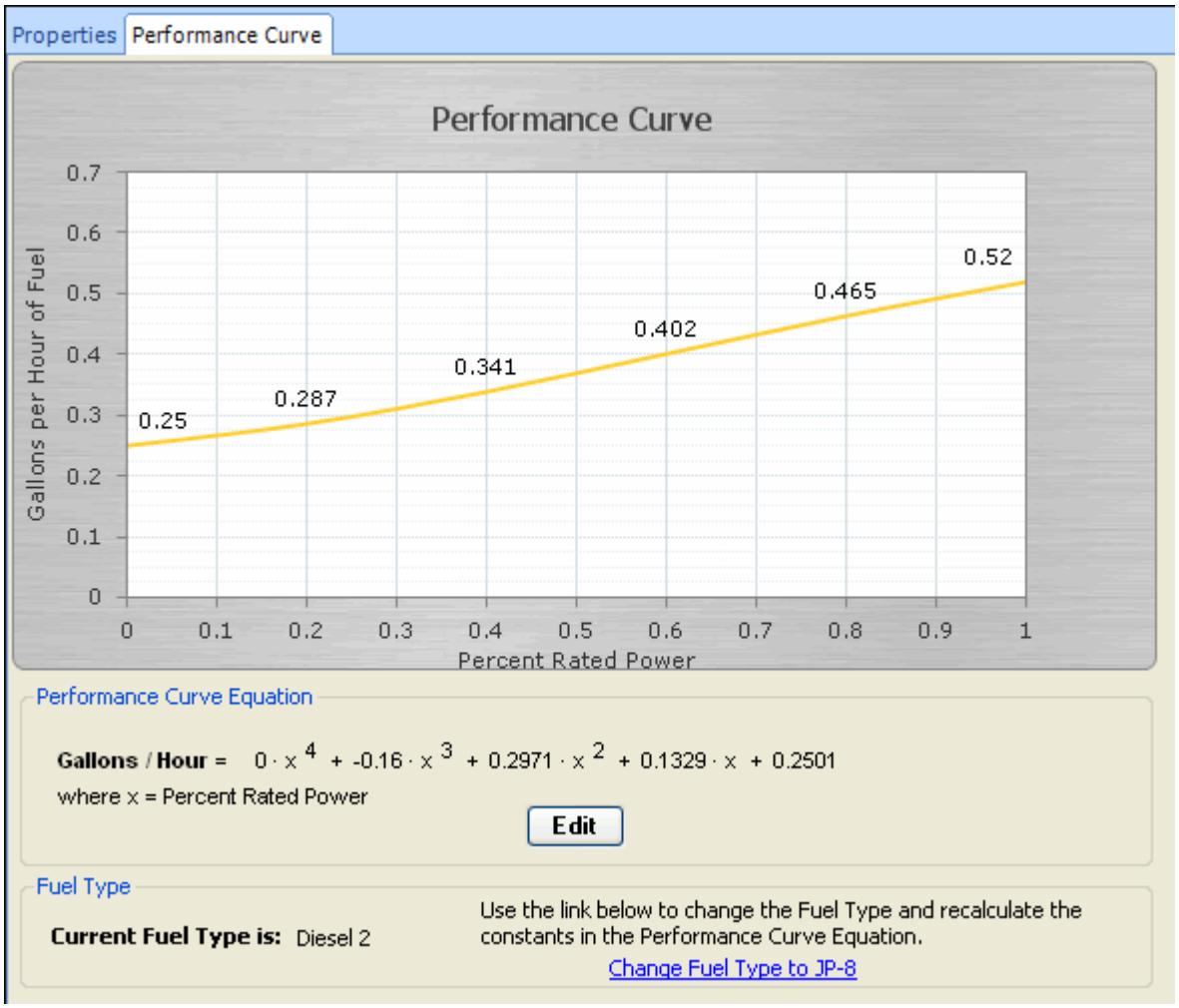

Performance Curve Tab while editing item

- **Edit Button** - Click the button to edit the Performance Curve Equation.
- **Change Fuel Type to JP-8** - Click this link to automatically change the fuel type used in the Performance Curve Equation. Changing the fuel type in this manner recalculates the Performance Curve Equation constants based on the relative difference between JP-8 and Diesel 2 fuels. To change the fuel type without this recalculation, click the **Edit** button instead.

Clicking the **Edit** button in the Performance Curve Equation section puts the tab in edit mode:

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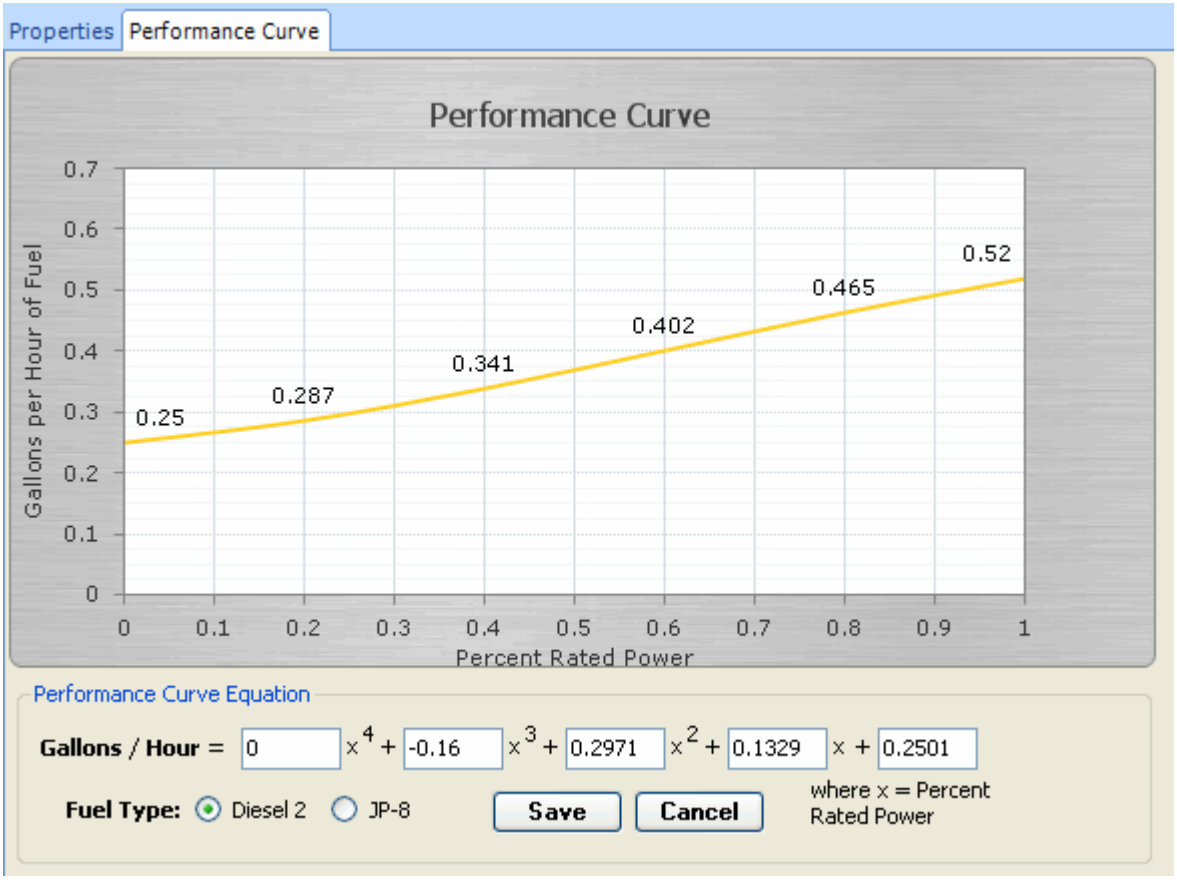

Performance Curve Tab in edit mode

While in edit mode, enter new Performance Curve Equation constants values and change the fuel type. Click the **Save** button to save changes or click **Cancel** to exit edit mode without saving.

13.4.2 Distribution Equipment

The **Layout Item Properties** window for distribution equipment has two tabs:

- Properties
- Connections Status

The **Properties** tab of the **Layout Item Properties** window for distribution equipment is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

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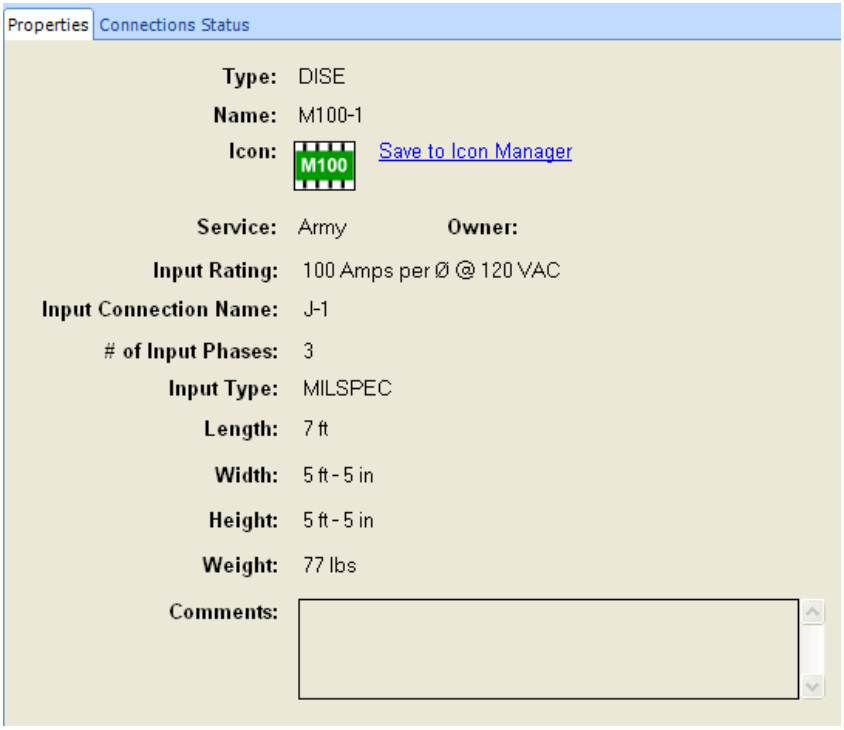

Layout Item Properties Window, Properties Tab - Distribution Equipment

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **Input Rating**: Item input rating in Amps at rated voltage
- **Input Connection Name**: Nameplate name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Additional Inputs:** Lists additional inputs available on item (this section is not shown if no additional inputs exist)
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Connections Status** tab of the **Layout Item Properties** window for distribution equipment is shown below. This tab lists all connections and connection properties for the distribution equipment.

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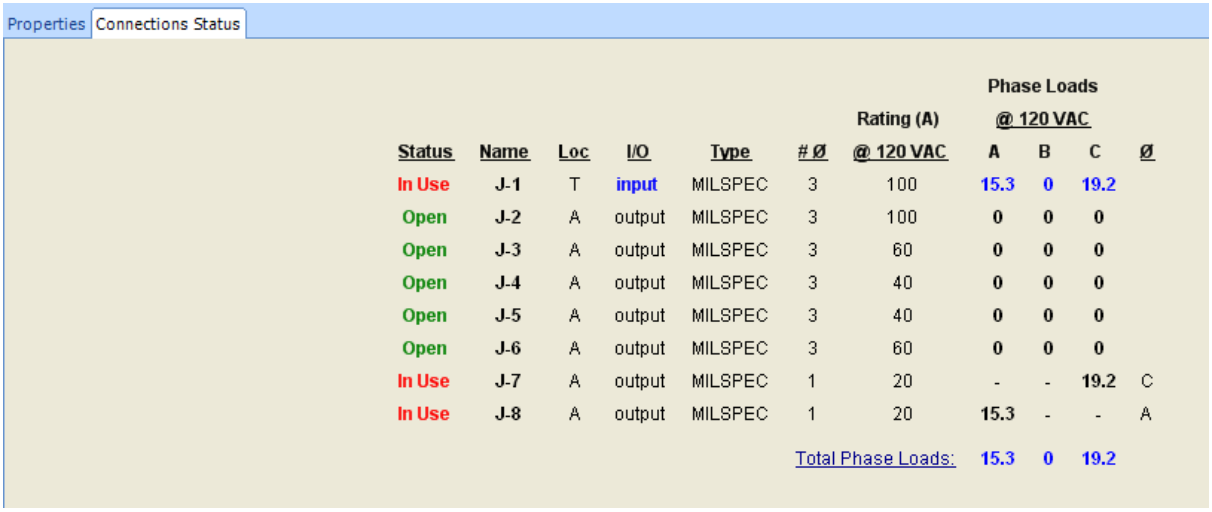
Properties | Connections Status

Status	Name	Loc	I/O	Type	# Ø	Rating (A) @ 120 VAC	Phase Loads @ 120 VAC A	B	C	Ø
In Use	J-1	T	input	MILSPEC	3	100	15.3	0	19.2	
Open	J-2	A	output	MILSPEC	3	100	0	0	0	
Open	J-3	A	output	MILSPEC	3	60	0	0	0	
Open	J-4	A	output	MILSPEC	3	40	0	0	0	
Open	J-5	A	output	MILSPEC	3	40	0	0	0	
Open	J-6	A	output	MILSPEC	3	60	0	0	0	
In Use	J-7	A	output	MILSPEC	1	20	-	-	19.2	C
In Use	J-8	A	output	MILSPEC	1	20	15.3	-	-	A
						Total Phase Loads:	15.3	0	19.2	

Layout Item Properties Window, Connections Status Tab - Distribution Equipment

- **Status:** The status of each connection - **Open** or **In Use**
- **Name:** Name of the connection
- **Loc:** The connection location of the connection
- **I/O:** Indicates if the connection is an input or output connection
- **Type:** Connector Type of the connection
- **# ∅:** The number of phases of the connection
- **Rating:** The rating of the connection, in Amps, at the rated voltage
- **Phase Loads:** The phase load on each phase of the connection, in Amps, at the rated voltage
- **Phase:** The phase of the connection

13.4.3 Consumers

The **Layout Item Properties** window for consumers has two tabs:

- Properties
- Connections Status

The **Properties** tab of the **Layout Item Properties** window for consumers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

AC Consumers

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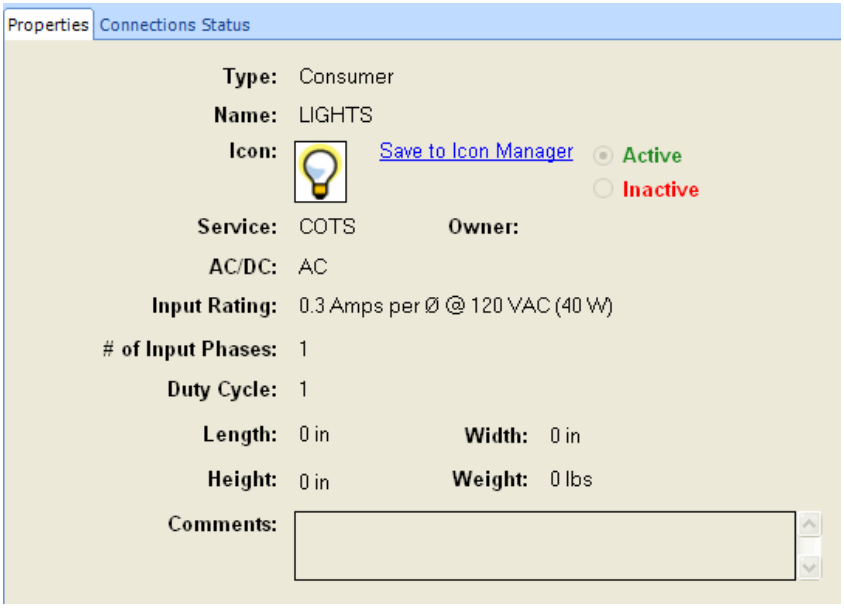

Layout Item Properties Window, Properties Tab - AC Consumers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Active/Inactive:** Indicates whether the consumer is currently active or inactive (on or off)
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **AC/DC:** Indicates whether the consumer is AC or DC.
- **Input Rating**: Item input rating in Amps per phase and kW at rated voltage
- **# of Input Phases:** Number of phases of the input connection
- **Duty Cycle:** Indicates the duty cycle of the consumer.
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

DC Consumers

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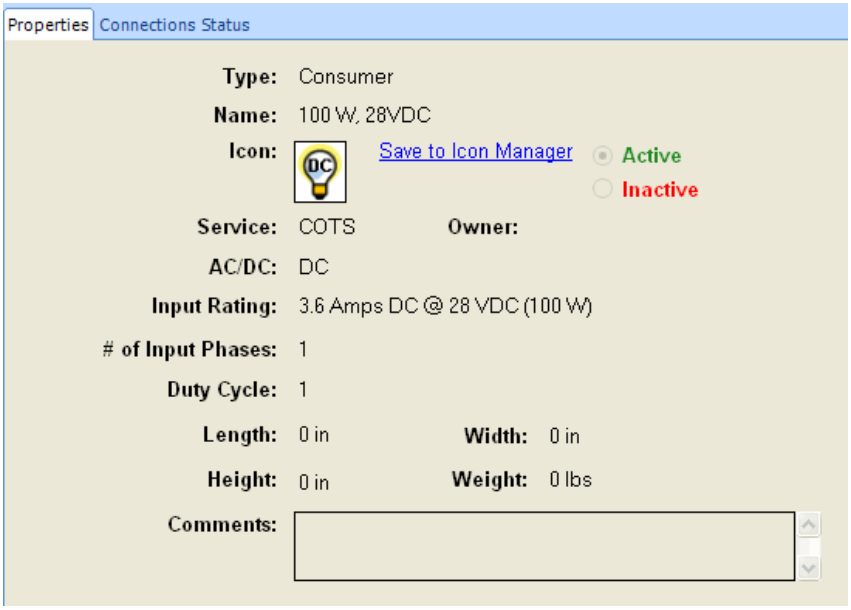
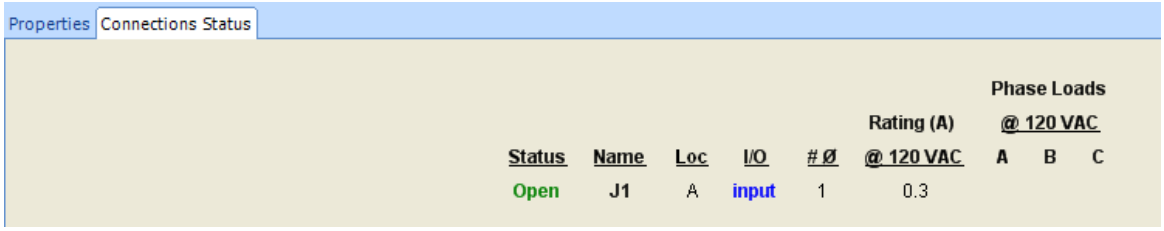


Layout Item Properties Window, Properties Tab - DC Consumers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Active/Inactive:** Indicates whether the consumer is currently active or inactive (on or off)
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **AC/DC:** Indicates whether the consumer is AC or DC.
- **Input Rating**: Item input rating in Watts
- **Rated DC Voltage:** The DC voltage rating of the consumer
- **Duty Cycle:** Indicates the duty cycle of the consumer.
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Connections Status** tab of the **Layout Item Properties** window for AC consumers is shown below. This tab provides information on the consumer input connection.



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Layout Item Properties Window, Connections Status Tab - Consumers

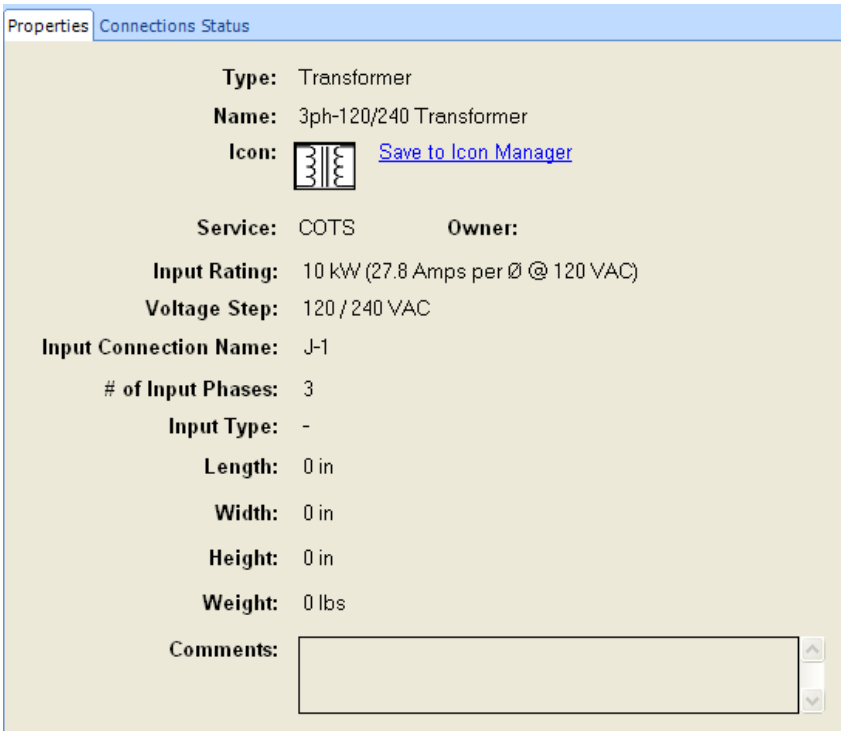
- **Status:** The status of the input connection - **Open** or **In Use**
- **Name:** Name of the input connection
- **Loc:** The connection location of the input connection
- **I/O:** Indicates if the connection is an input or output connection
- **Type:** Connector Type of the input connection
- **# ∅:** The number of phases of the input connection
- **Rating:** The rating of the connection, in Amps, at rated voltage
- **Phase Loads:** The phase load on each phase of the input connection, in Amps, at rated voltage

13.4.4 Transformers

The **Layout Item Properties** window for transformers has two tabs:

- Properties
- Connections Status

The **Properties** tab of the **Layout Item Properties** window for transformers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).



Layout Item Properties Window, Properties Tab - Transformers

- **Name:** The name of the item

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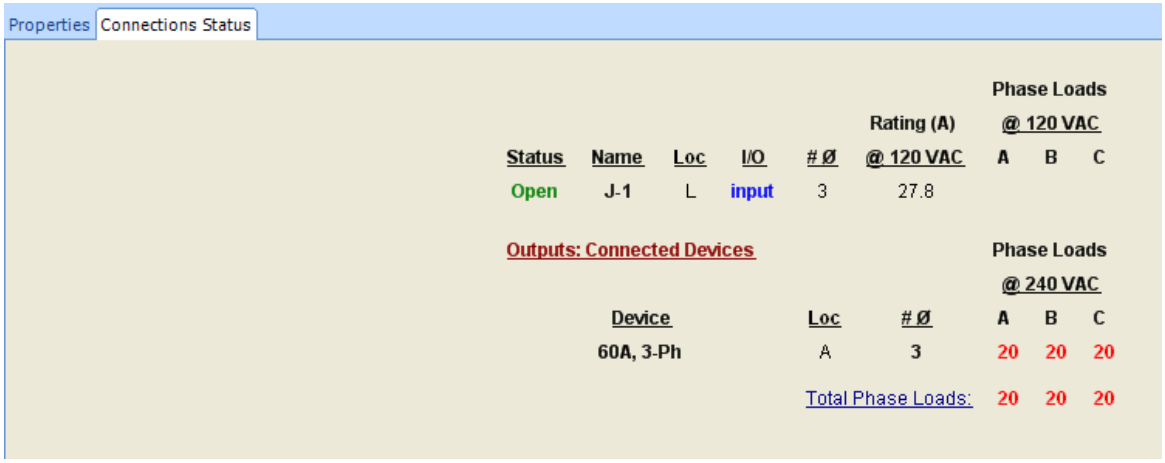
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **Input Rating**: Transformer rating in kW and Amps per phase at input voltage
- **Voltage Step:** The input and output voltages
- **Input Connection Name**: Name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Connections Status** tab of the **Layout Item Properties** window for transformers is shown below. This tab lists all connections and their status.



Layout Item Properties Window, Connections Status Tab - Transformers

For Input Connection:

- **Status:** The status of the input connection - **Open** or **In Use**
- **Name:** Name of the connection
- **Loc:** The connection location of each connection
- **I/O:** Indicates if the connection is an input or output connection
- **# ∅:** The number of phases of each connection
- **Rating:** The rating of the connection, in Amps AC, at the rated input voltage
- **Phase Loads:** The phase load on each phase of the input connection, in Amps AC, at the rated input voltage
- **Phase**: Local phase of the connection, if defined

For Outputs: Connected Devices:

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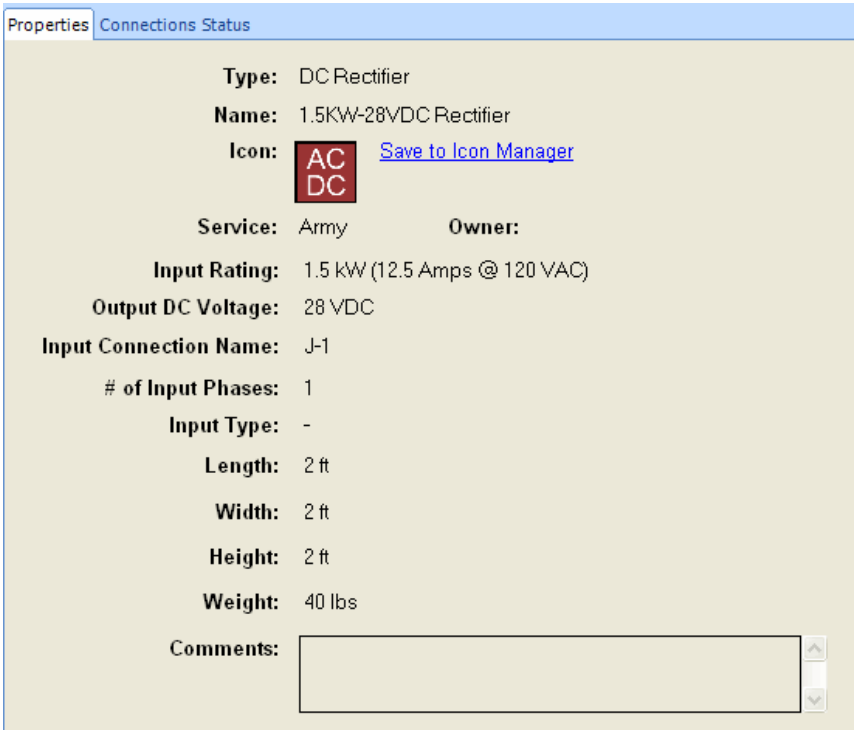
- **Device:** The name of the item connected to the transformer output
- **Loc:** The connection location of each connection
- **# ∅:** The number of phases of each connection
- **Phase Loads:** The phase load on each phase of the output connection, in Amps AC, at the rated output voltage
- **Phase**: Local phase of the connection, if defined

13.4.5 DC Rectifiers

The **Layout Item Properties** window for DC rectifiers has two tabs:

- Properties
- Connections Status

The **Properties** tab of the **Layout Item Properties** window for DC rectifiers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).



Layout Item Properties Window, Properties Tab - DC Rectifiers

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*

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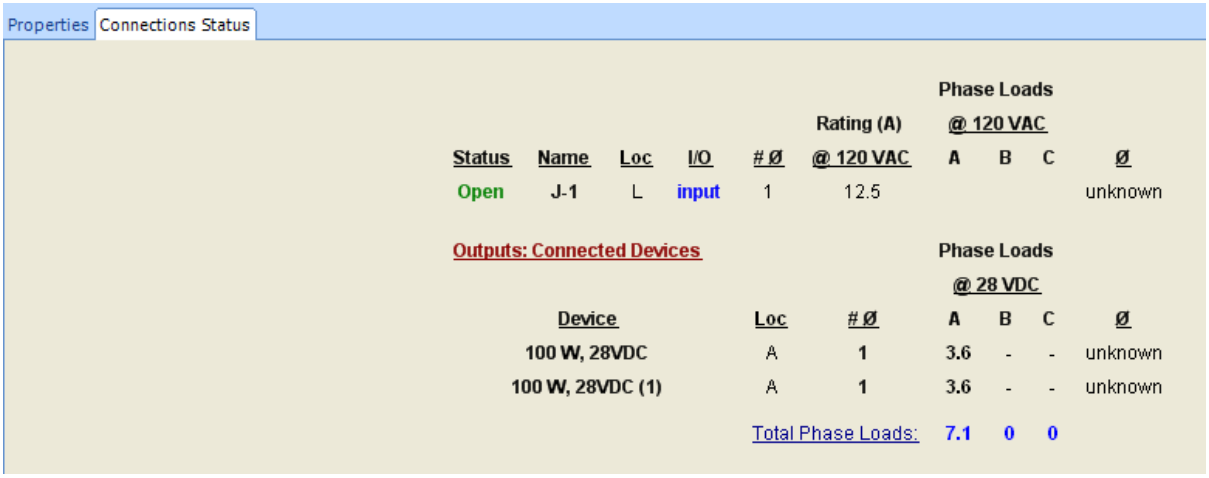
- **Input Rating**: Item input rating in kilowatts (kW) and Amps AC at rated VAC
- **Output DC Voltage:** The DC voltage rating of the DC rectifier
- **Input Connection Name**: Name of input connection
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Connections Status** tab of the **Layout Item Properties** window for DC rectifiers is shown below. This tab lists all connections and their status.


Properties
Connections Status
Phase Loads
Rating (A) @ 120 VAC
Status Name Loc I/O # Ø @ 120 VAC A B C Ø
Open J-1 L input 1 12.5 unknown
Outputs: Connected Devices
Phase Loads @ 28 VDC
Device Loc # Ø A B C Ø
100 W, 28VDC A 1 3.6 - - unknown
100 W, 28VDC (1) A 1 3.6 - - unknown
Total Phase Loads: 7.1 0 0

Layout Item Properties Window, Connections Status Tab - DC Rectifiers

For Input Connection:

- **Status:** The status of the input connection - **Open** or **In Use**
- **Name:** Name of the connection
- **Loc:** The connection location of each connection
- **I/O:** Indicates if the connection is an input or output connection
- **# ∅:** The number of phases of each connection
- **Rating:** The rating of the connection, in Amps AC, at the rated VAC
- **Phase Loads:** The phase load on each phase of the input connection, in Amps DC, at the rated VDC
- **Phase**: Local phase of the connection, if defined

For Outputs: Connected Devices:

- **Device:** The name of the item connected to the DC Rectifier output
- **Loc:** The connection location of each connection

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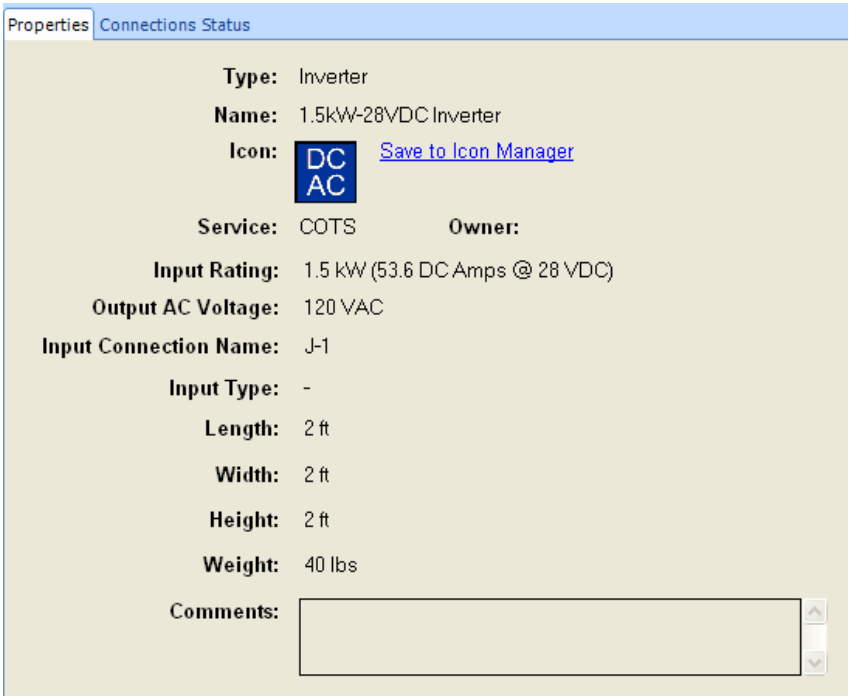
- **# ∅:** The number of phases of each connection
- **Phase Loads:** The phase load on each phase of the output connection, in DC Amps, at the rated VDC
- **Phase**: Local phase of the connection, if defined

13.4.6 Inverters

The **Layout Item Properties** window for inverters has two tabs:

- Properties
- Connections Status

The **Properties** tab of the **Layout Item Properties** window for transformers is shown below. User-defined items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).



Layout Item Properties Window, Properties Tab - Inverters

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Owner:** The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **Input Rating**: Item input rating in kilowatts (kW) and DC Amps at rated VDC
- **Output AC Voltage:** The AC voltage rating of the inverter
- **Input Connection Name**: Name of input connection

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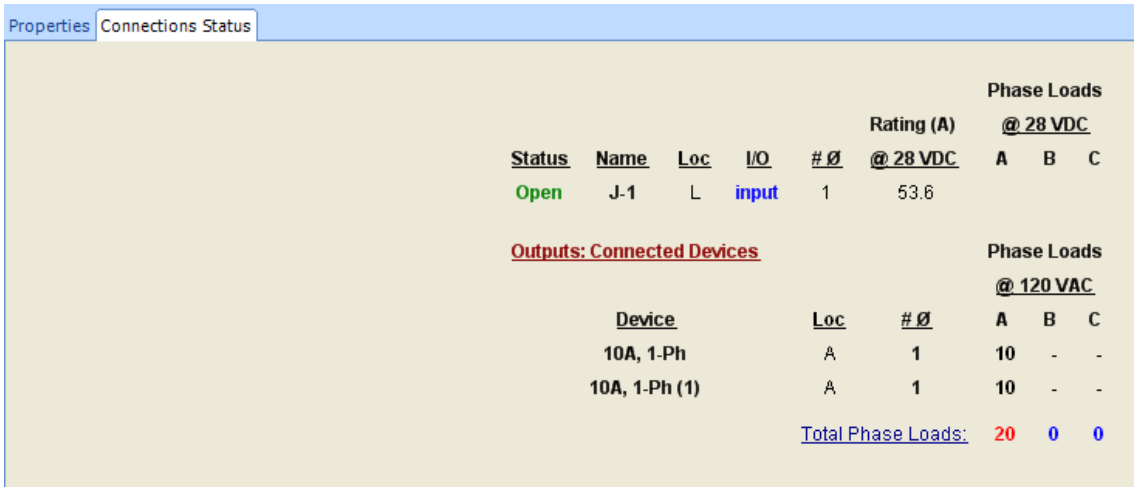
- **# of Input Phases:** Number of phases of the input connection
- **Length**: Item length, in feet *(for reference only...not utilized by AutoDISE)*
- **Width**: Item width, in feet *(for reference only...not utilized by AutoDISE)*
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Connections Status** tab of the **Layout Item Properties** window for inverters is shown below. This tab lists all connections and their status.


Properties
Connections Status
Phase Loads
Rating (A)
@ 28 VDC
Status Name Loc I/O # Ø @ 28 VDC A B C
Open J-1 L input 1 53.6
Outputs: Connected Devices
Phase Loads
@ 120 VAC
Device Loc # Ø A B C
10A, 1-Ph A 1 10 - -
10A, 1-Ph (1) A 1 10 - -
Total Phase Loads: 20 0 0

Layout Item Properties Window, Connections Status Tab - Inverters

For Input Connection:

- **Status:** The status of the input connection - **Open** or **In Use**
- **Name:** Name of the connection
- **Loc:** The connection location of each connection
- **I/O:** Indicates if the connection is an input or output connection
- **# ∅:** The number of phases of each connection
- **Rating:** The rating of the input connection, in DC Amps
- **Phase Loads:** The phase load on each phase of the input connection, in DC Amps, at the rated VDC
- **Phase**: Local phase of the connection, if defined

For Outputs: Connected Devices:

- **Device:** The name of the item connected to the transformer output
- **Loc:** The connection location of each connection
- **# ∅:** The number of phases of each connection
- **Phase Loads:** The phase load on each phase of the output connection, in Amps AC, at the rated VAC

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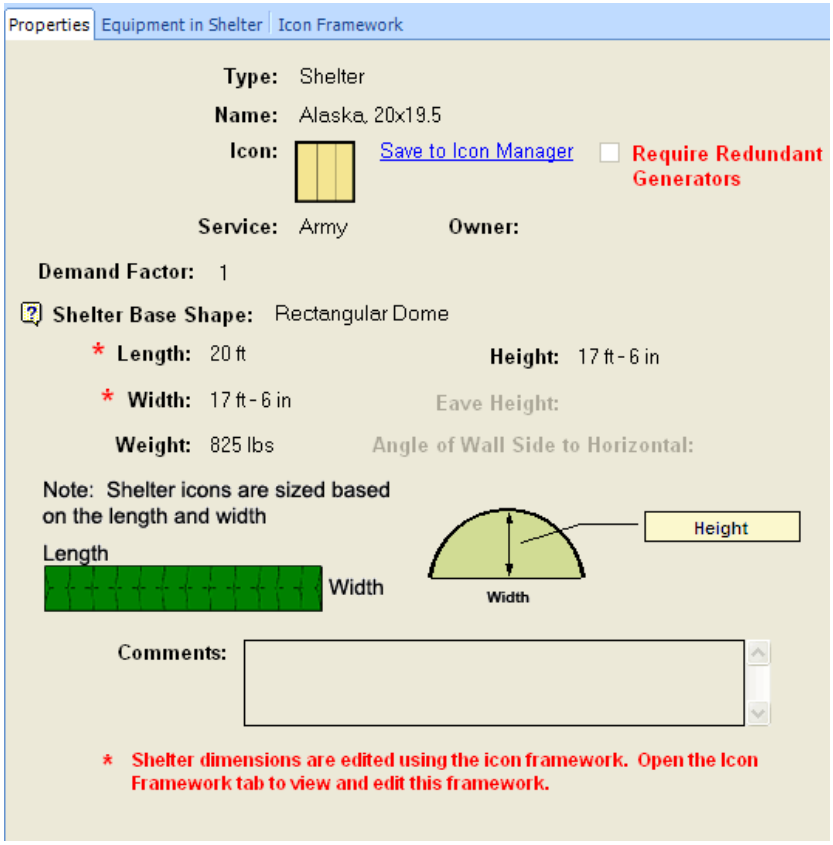
- **Phase**: Local phase of the connection, if defined

13.4.7 Shelters/Tents

The **Layout Item Properties** window for shelters/tents has three tabs:

- Properties
- Equipment In Shelter
- Icon Framework

The **Properties** tab of the **Layout Item Properties** window for shelters/tents is shown below. Items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).



Layout Item Properties Window, Properties Tab - Shelters/Tents

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Demand Factor**: The demand factor for the shelter.
- **Length**: Item length, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Width**: Item width, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***

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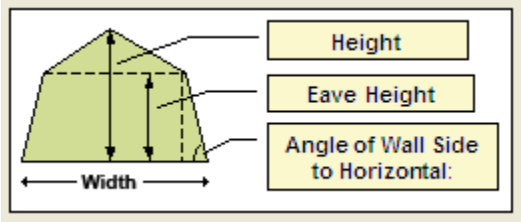
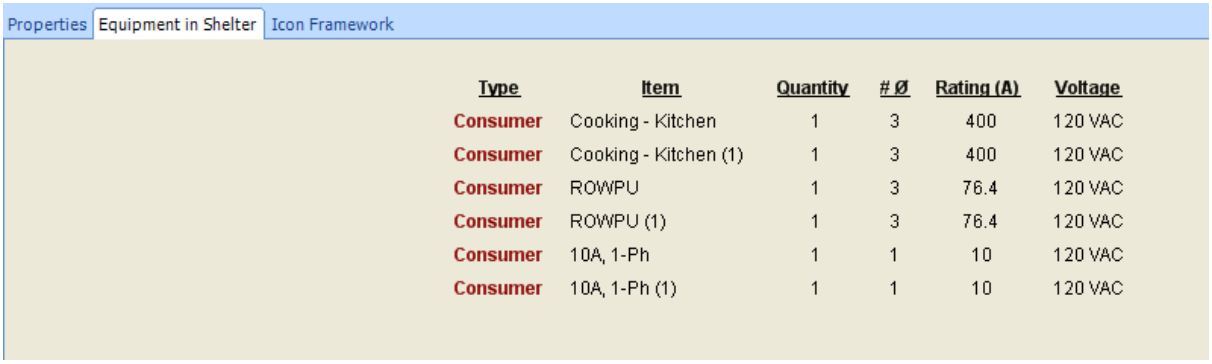
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Shelter Base Shape**: The base shape of the shelter
- **Height**: Shelter height, in feet, from the ground to the tallest point on the shelter. See image below.
- **Eave Height**: Height, in feet, from the ground to the top of the wall side See image below.
- **Angle of Wall Side to Horizontal**: The angle between the horizontal ground and the wall side See image below.
- **Comments**: Any miscellaneous comments made about this item



Height, Eave Height and Angle of Wall Side to Horizontal

Note: ***If the Shelter Base Shape is set to Rectangular Dome, then the Eave Height and Angle of Wall Side to Horizontal have no meaning and will be disabled.***

The **Equipment in Shelter** tab of the **Layout Item Properties** window for shelters/tents is shown below. This tab lists all equipment residing in the shelter.



Type	Item	Quantity	# Ø	Rating (A)	Voltage
Consumer	Cooking - Kitchen	1	3	400	120 VAC
Consumer	Cooking - Kitchen (1)	1	3	400	120 VAC
Consumer	ROWPU	1	3	76.4	120 VAC
Consumer	ROWPU (1)	1	3	76.4	120 VAC
Consumer	10A, 1-Ph	1	1	10	120 VAC
Consumer	10A, 1-Ph (1)	1	1	10	120 VAC

Layout Item Properties Window, Equipment in Shelter Tab - Shelters/Tents

- **Type:** Type of equipment (generator, consumer, distribution, etc)
- **Item:** Name of equipment
- **Quantity:** Number of pieces of equipment with this name, rating and number of phases
- **# ∅:** Number of phases of the equipment's input connection
- **Rating:** Rating of the equipment input connection in Amps
- **Voltage:** The rated AC and/or DC voltages of the equipment

The **Icon Framework** tab allows the user to view the current icon framework, as well as

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access the Icon Framework Editor. See Icon Framework Tab for more information.

13.4.8 Non-Electrical Equipment

The **Properties** tab of the **Layout Item Properties** window for non-electrical equipment is shown below. Items may be edited by clicking on the **Edit** button at the bottom of the window (not shown below).

Layout Item Properties Window, Properties Tab - Non-electrical Equipment

- **Name:** The name of the item
- **Icon:** The icon associated with this item
- **Service:** Military service (or DoD or COTS) affiliated with the item
- **Length**: Item length, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Width**: Item width, in feet - ***used by AutoDISE for proportional drawing of shelter on layout***
- **Height**: Item height, in feet *(for reference only...not utilized by AutoDISE)*
- **Weight**: Item weight, in lbs *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item

The **Icon Framework** tab allows the user to view the current icon framework, as well as access the Icon Framework Editor. See Icon Framework Tab for more information.

13.5 Cable Properties

The **Cable Properties** window displays a list of all cables in the Toolbox and the properties of each cable.

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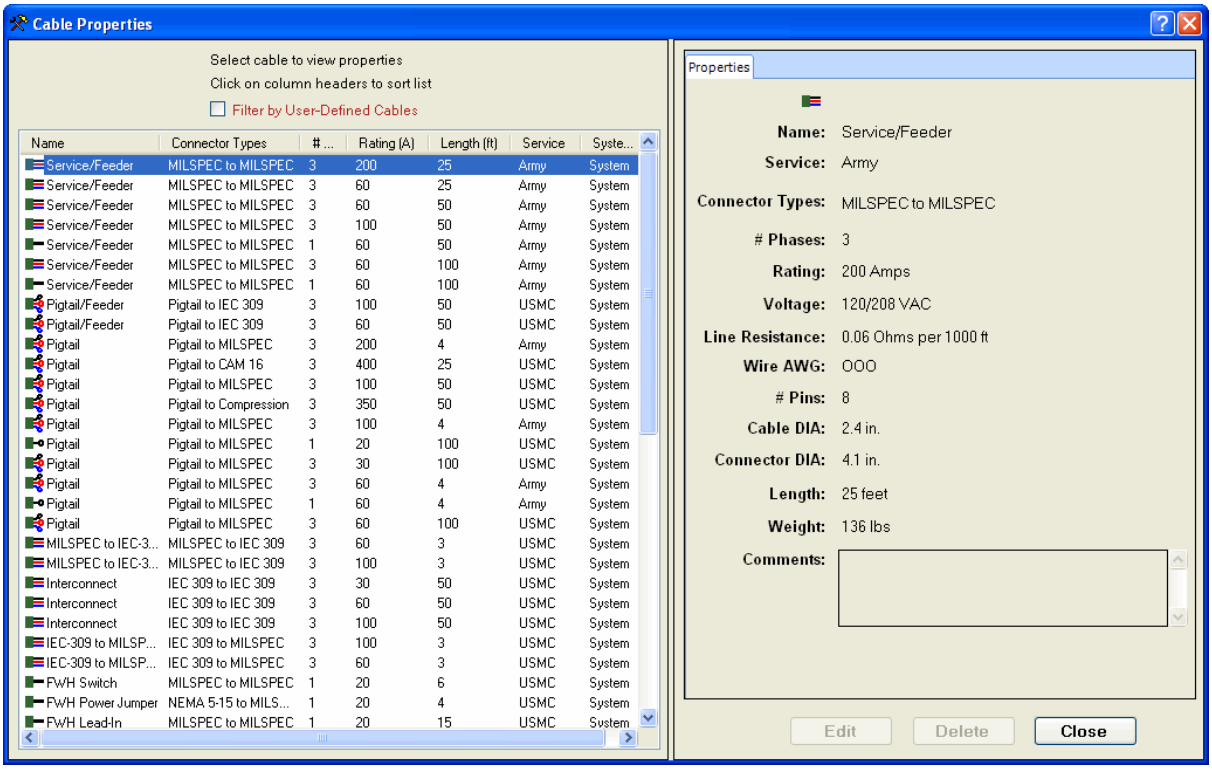
Open the **Cable Properties** window by selecting **View Toolbox Cables** from the Toolbox Menu.


Cable Properties
Select cable to view properties
Click on column headers to sort list
Filter by User-Defined Cables
Name
Connector Types
...
Rating (A)
Length (ft)
Service
Syste...
Service/Feeder MILSPEC to MILSPEC 3 200 25 Army System
Service/Feeder MILSPEC to MILSPEC 3 60 25 Army System
Service/Feeder MILSPEC to MILSPEC 3 60 50 Army System
Service/Feeder MILSPEC to MILSPEC 3 100 50 Army System
Service/Feeder MILSPEC to MILSPEC 1 60 50 Army System
Service/Feeder MILSPEC to MILSPEC 3 60 100 Army System
Service/Feeder MILSPEC to MILSPEC 1 60 100 Army System
Pigtail/Feeder Pigtail to IEC 309 3 100 50 USMC System
Pigtail/Feeder Pigtail to IEC 309 3 60 50 USMC System
Pigtail Pigtail to MILSPEC 3 200 4 Army System
Pigtail Pigtail to CAM 16 3 400 25 USMC System
Pigtail Pigtail to MILSPEC 3 100 50 USMC System
Pigtail Pigtail to Compression 3 350 50 USMC System
Pigtail Pigtail to MILSPEC 3 100 4 Army System
Pigtail Pigtail to MILSPEC 1 20 100 USMC System
Pigtail Pigtail to MILSPEC 3 30 100 USMC System
Pigtail Pigtail to MILSPEC 3 60 4 Army System
Pigtail Pigtail to MILSPEC 1 60 4 Army System
Pigtail Pigtail to MILSPEC 3 60 100 USMC System
MILSPEC to IEC-3... MILSPEC to IEC 309 3 60 3 USMC System
MILSPEC to IEC-3... MILSPEC to IEC 309 3 100 3 USMC System
Interconnect IEC 309 to IEC 309 3 30 50 USMC System
Interconnect IEC 309 to IEC 309 3 60 50 USMC System
Interconnect IEC 309 to IEC 309 3 100 50 USMC System
IEC-309 to MILSP... IEC 309 to MILSPEC 3 100 3 USMC System
IEC-309 to MILSP... IEC 309 to MILSPEC 3 60 3 USMC System
FWH Switch MILSPEC to MILSPEC 1 20 6 USMC System
FWH Power Jumper NEMA 5-15 to MILS... 1 20 4 USMC System
FWH Lead-In MILSPEC to MILSPEC 1 20 15 USMC System
Properties
Name: Service/Feeder
Service: Army
Connector Types: MILSPEC to MILSPEC
Phases: 3
Rating: 200 Amps
Voltage: 120/208 VAC
Line Resistance: 0.06 Ohms per 1000 ft
Wire AWG: OOO
Pins: 8
Cable DIA: 2.4 in.
Connector DIA: 4.1 in.
Length: 25 feet
Weight: 136 lbs
Comments:
Edit
Delete
Close

Cable Properties Window

- **Name:** The name of the cable
- **Service:** The service of the cable
- **Connector Types:** The connector types of the two ends of the cable
- **# Phases:** The number of phases the cable handles
- **Rating:** The rating of the cable, in Amps
- **Voltage:** The rated voltage of the cable
- **Line Resistance:** The resistance of the cable, in ohms per 1000 feet, calculated from the wire AWG of the cable
- **∅ wire AWG:** The gauge of a single phase wire in the cable
- **Cable DIA:** The diameter of the cable, in inches
- **Connector DIA:** The diameter of the cable end connector, in inches
- **Length:** The length of the cable, in feet
- **Weight:** The weight of the cable, in lbs
- **Comments:** Any comments about the cable

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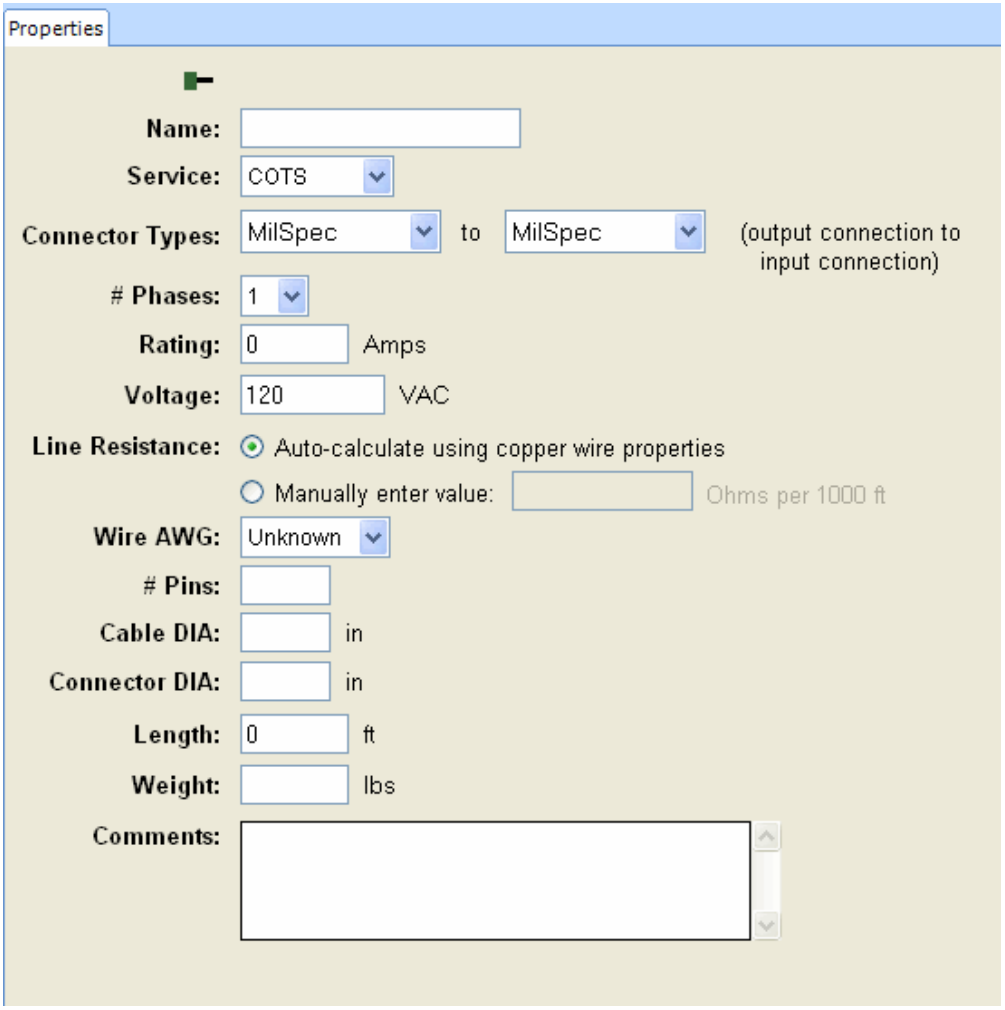
13.6 Toolbox - Add New Cable

The **Toolbox - Add New Cable** window allows a user to add a new user-defined cable to the Toolbox.

To open this window, select **Add New Cable to Toolbox** from the Toolbox menu.



Toolbox - Add New Cable Window

- **Name:** The name of the cable
- **Service:** The service of the cable
- **Connector Types:** The connector types of the two ends of the cable
- **# Phases:** The number of phases the cable handles
- **Rating:** The rating of the cable, in Amps
- **Voltage:** The rated voltage of the cable
- **Line Resistance:** The resistance of the cable, in ohms per 1000 feet, calculated from the wire AWG of the cable. The user has the option of letting AutoDISE auto-calculate this value based on standard copper wire properties, or manually entering the value, in Ohms per 1000 feet.

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- ∅ **wire AWG:** The gauge of a single phase wire in the cable
- **Cable DIA:** The diameter of the cable, in inches
- **Connector DIA:** The diameter of the cable end connector, in inches
- **Length:** The length of the cable, in feet
- **Weight:** The weight of the cable, in lbs
- **Comments:** Any comments about the cable

13.7 Editing Cables in the Toolbox

User-defined cables in the Toolbox may be edited. This can be done by selecting **View Toolbox Cables** from the Toolbox menu. The Cable Properties window appears. Click on the left side of the window to select the cable you wish to edit.

See Cable Properties for information on the fields to edit.

13.8 Layout Properties

The **Layout Properties** window allows the user the customize the appearance and behavior of individual layouts. The **Layout Properties** window may be viewed and modified by selecting **Layout Properties** in the Layout Menu or clicking on the **Layout Properties** button on the Main Toolbar.

The window has the following tabs:

- Main Layout
- Shelter Layouts
- Scale
- Links
- Electrical Cables
- Environment
- Warnings
- Electrical

The **Restore User Defaults** button at the bottom of the window will modify all settings to the default layout properties set in the Default Layout Properties window. Absolutely NO changes are saved, including restored defaults, until the **Save** button is clicked.

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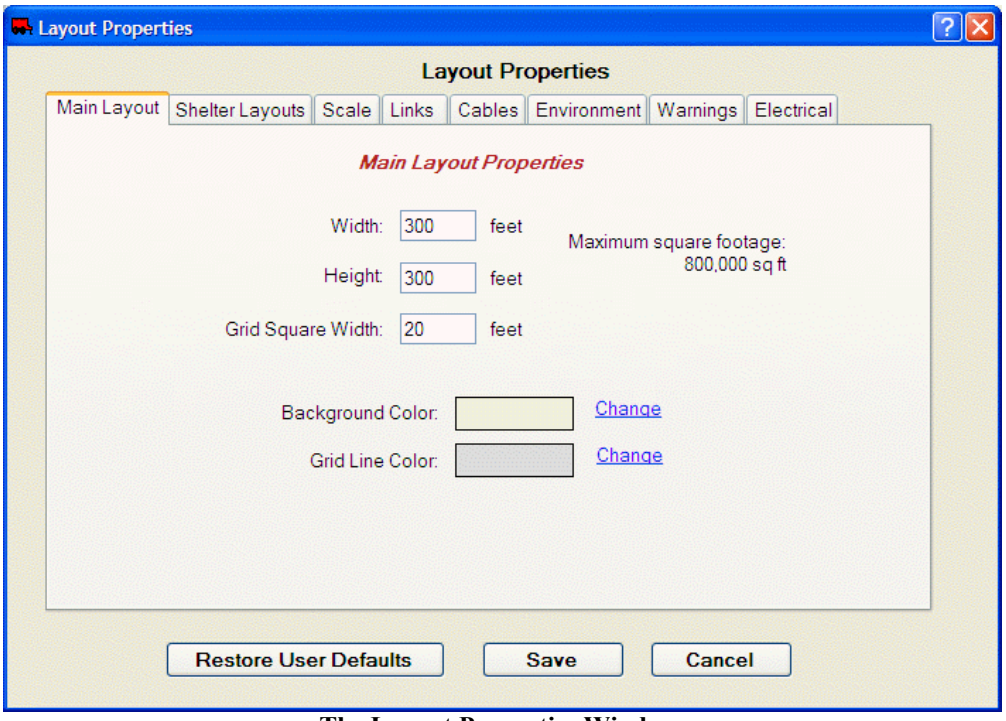
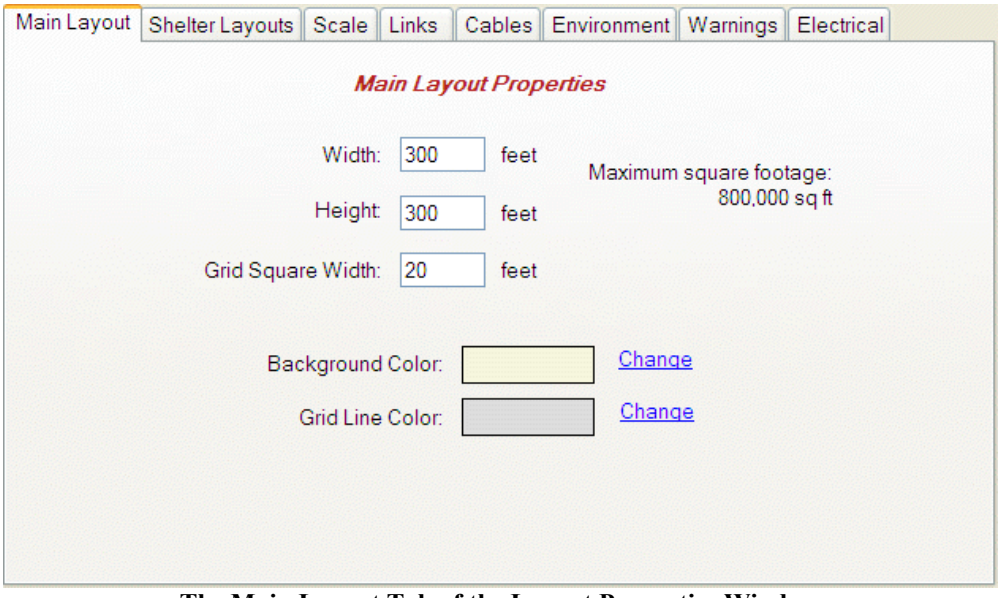


The Layout Properties Window

13.8.1 Main Layout Properties

The **Main Layout** tab of **the** Layout Properties window contains properties that ONLY affect the main layout view. The tab is shown below:



The Main Layout Tab of the Layout Properties Window

- **Width:** The main layout width, in feet
- **Height:** The main layout height, in feet

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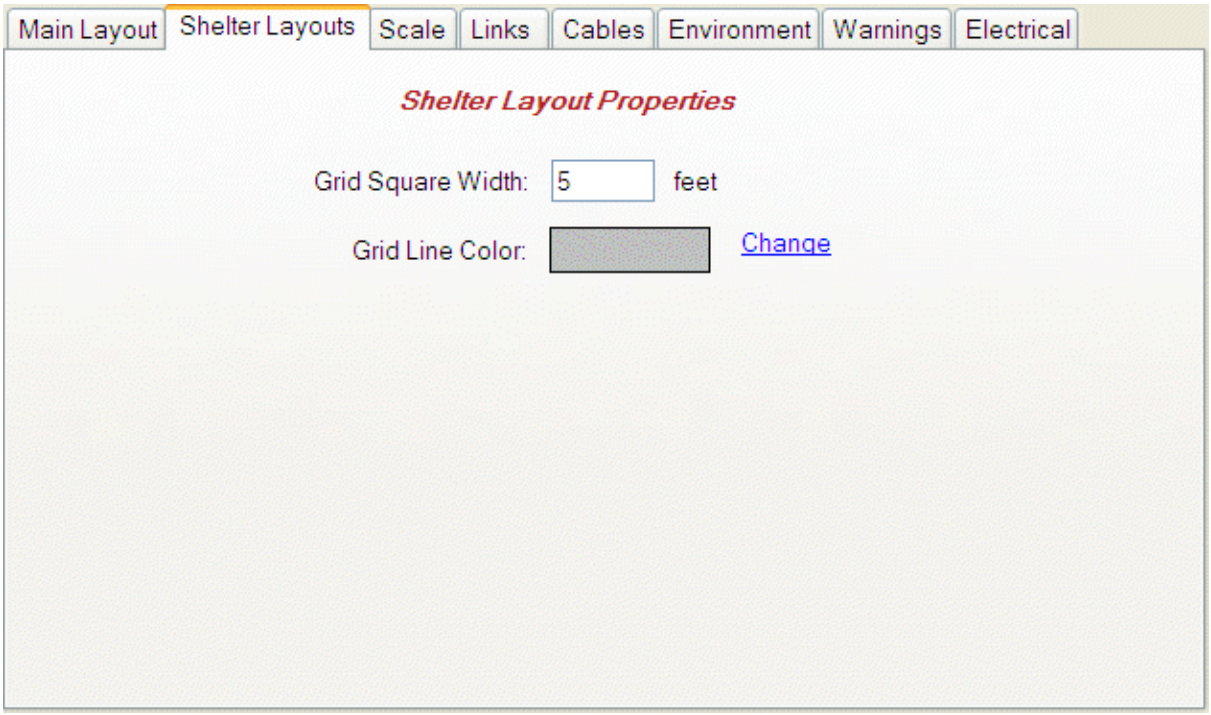
Note: Currently, the main layout has a maximum square footage of 800,000 sq. ft.

- **Grid Square Width:** The distance, in feet, between grid lines on the main layout
- **Background Color:** The color of the main layout background
- **Grid Line Color:** The color of the main layout grid lines

13.8.2 Shelter Layout Properties

The **Shelter Layouts** tab of the Layout Properties window contains properties that **ONLY** affect the shelter layout views. The tab is shown below:



The Shelter Layouts Tab of the Layout Properties Window

- **Grid Square Width:** The distance, in feet, between grid lines on shelter layouts
- **Grid Line Color:** The color of shelter layout grid lines

13.8.3 Scale Properties

The **Scale** tab of the Layout Properties window contains properties that affects both the main layout view AND all shelter layout views. The tab is shown below:

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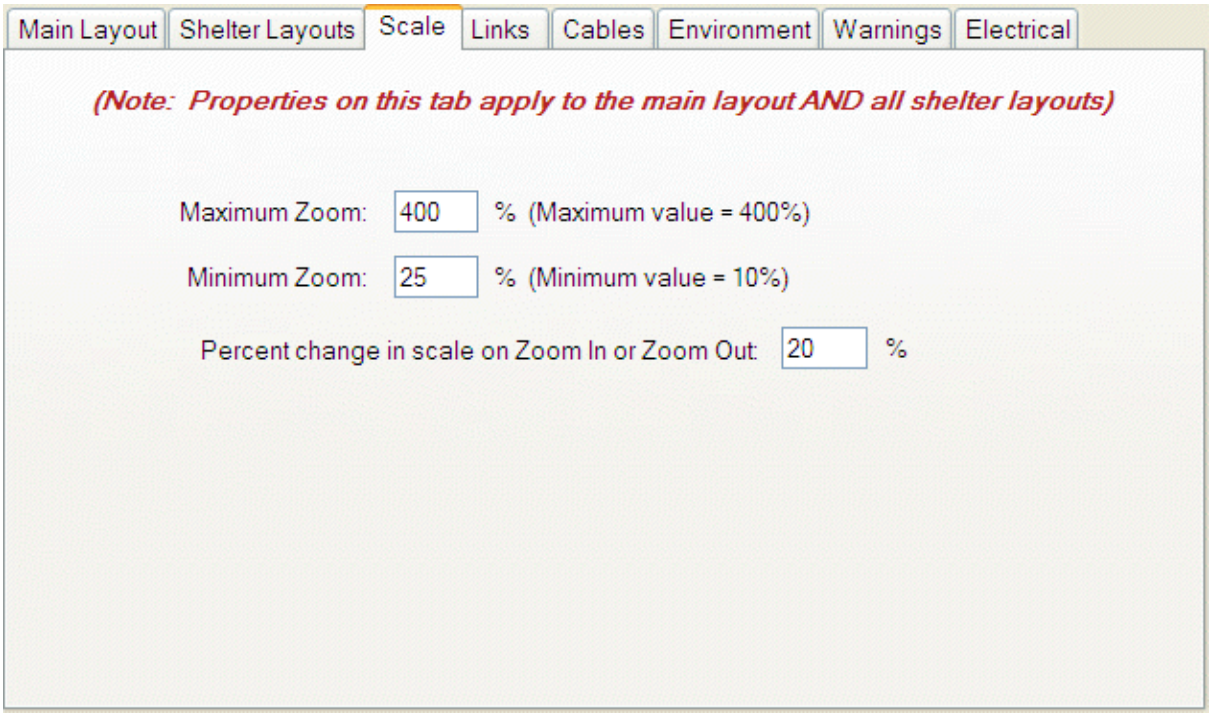
Main Layout
Shelter Layouts
Scale
Links
Cables
Environment
Warnings
Electrical
(Note: Properties on this tab apply to the main layout AND all shelter layouts)
Maximum Zoom: 400 % (Maximum value = 400%)
Minimum Zoom: 25 % (Minimum value = 10%)
Percent change in scale on Zoom In or Zoom Out: 20 %

The Scale Tab of the Layout Properties Window

- **Maximum Zoom:** The maximum zoom allowed, as a percentage. For shelter layout views, 100% zoom is defined as the zoom when the shelter layout is opened and maximized to fit within the current screen.
- **Minimum Zoom:** The minimum zoom allowed, as a percentage. For shelter layout views, 100% zoom is defined as the zoom when the shelter layout is opened and maximized to fit within the current screen.
- **Percent change in scale on Zoom In or Zoom Out:** When a user uses the Zoom In or Zoom Out modes to zoom a layout, the zoom changes by the specified percent.

13.8.4 Links Properties

The **Links** tab of the Layout Properties window contains properties that affect both the main layout view AND all shelter layout views. The tab is shown below:

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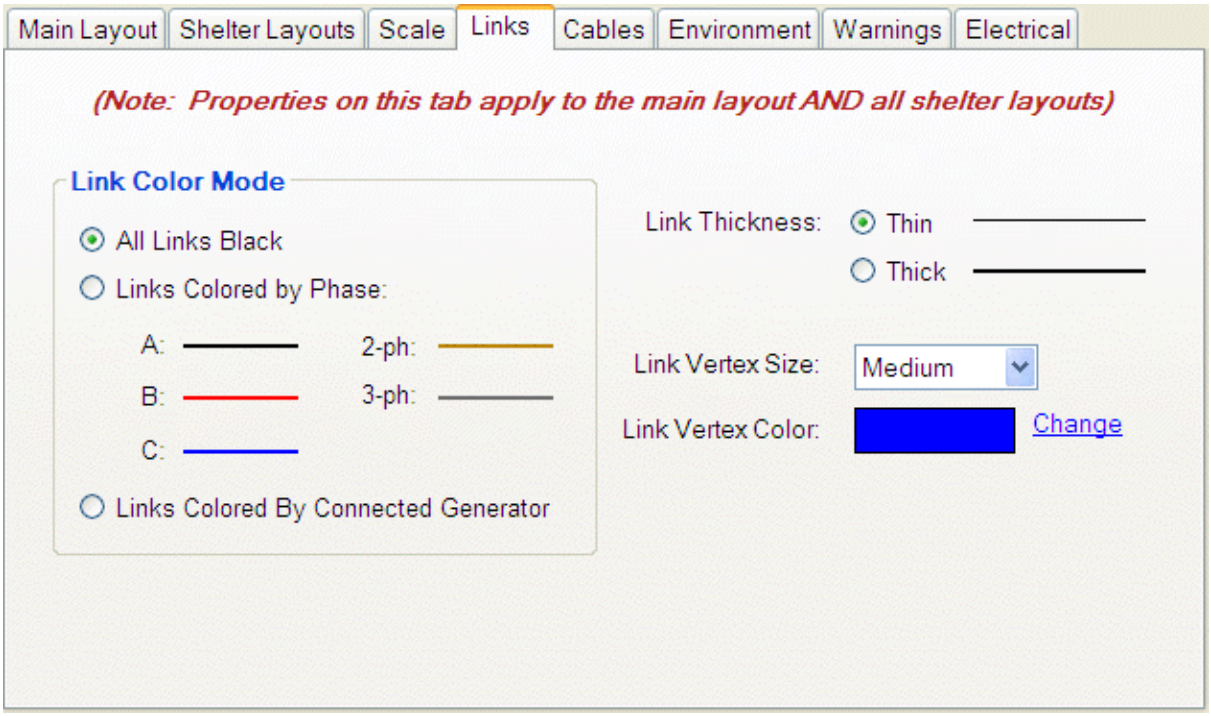

The Links Tab of the Layout Properties Window

- **Link Color Mode:** This specifies the color scheme for drawing links on all layouts:

    1. All Links Black - all links are drawn in black
    2. Links Colored by Phase - links are drawn the color which specifies either the number of phases in the link, or, for single phase links, the generator phase of the current carried by the link
    3. Links Colored By Connected Generator - When multiple generators exists on a layout, links for each generator are drawn a different color.

- **Link Thickness:** Specify the thickness of all links to be thin or thick
- **Link Vertex Size:** Specify the size of link vertices as small, medium or large
- **Link Vertex Color:** Specify the color for link vertices

13.8.5 Electrical Cables Properties

The **Electrical Cables** tab of the Layout Properties window contains properties that affect both the main layout view AND all shelter layout views. The tab is shown below:

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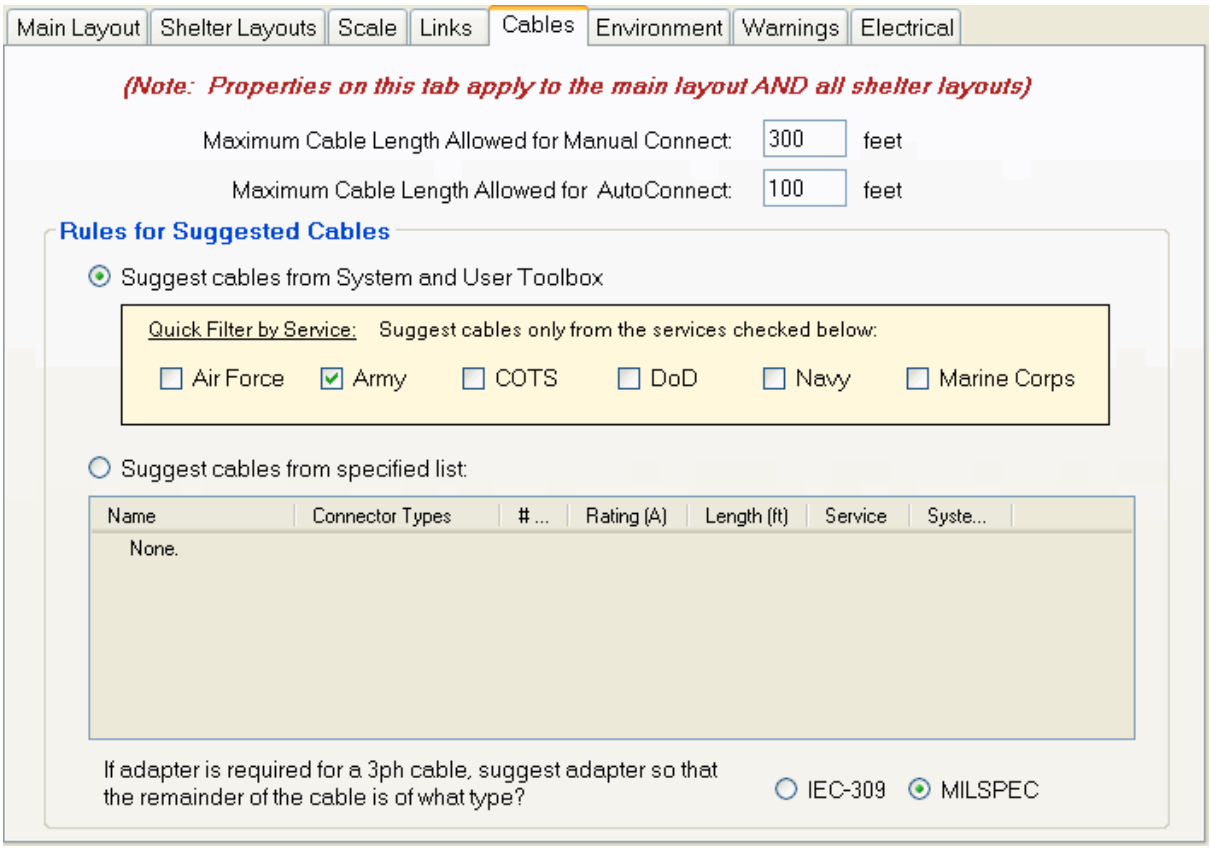

The Electrical Cables Tab of the Layout Properties Window

- **Maximum Cable Length Allowed for Manual Connect:** When connecting two items using manual connect, AutoDISE will limit the allowed length of the link to the specified value.

  Note: this does NOT prevent the user from moving two items closer, linking them, then moving them back to their original location such that the end result is a link greater than the specified amount. The purpose of this manual connect restriction is to flag the user that there is a length issue.

- **Maximum Cable Length Allowed for AutoConnect:** This specifies the maximum cable length that AutoConnect will allow when running the AutoConnect algorithm.

- **Rules for Suggested Cables:** Suggested cables are utilized when viewing the Link Properties window, when populating cable entries in an Inventory View, and when calculating voltage drops between items. Two parameters may be set by the user to affect which cables are suggested for links:

  1. **"Suggest cables from System and User Toolbox" -** This option forces the cable suggestion algorithm to select from all cables in the System and User Toolbox, with the option to filter cables from specific services, as shown in the **Quick Filter by Service** options directly below. See suggested cables for detailed information on the

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cable suggestion algorithm.

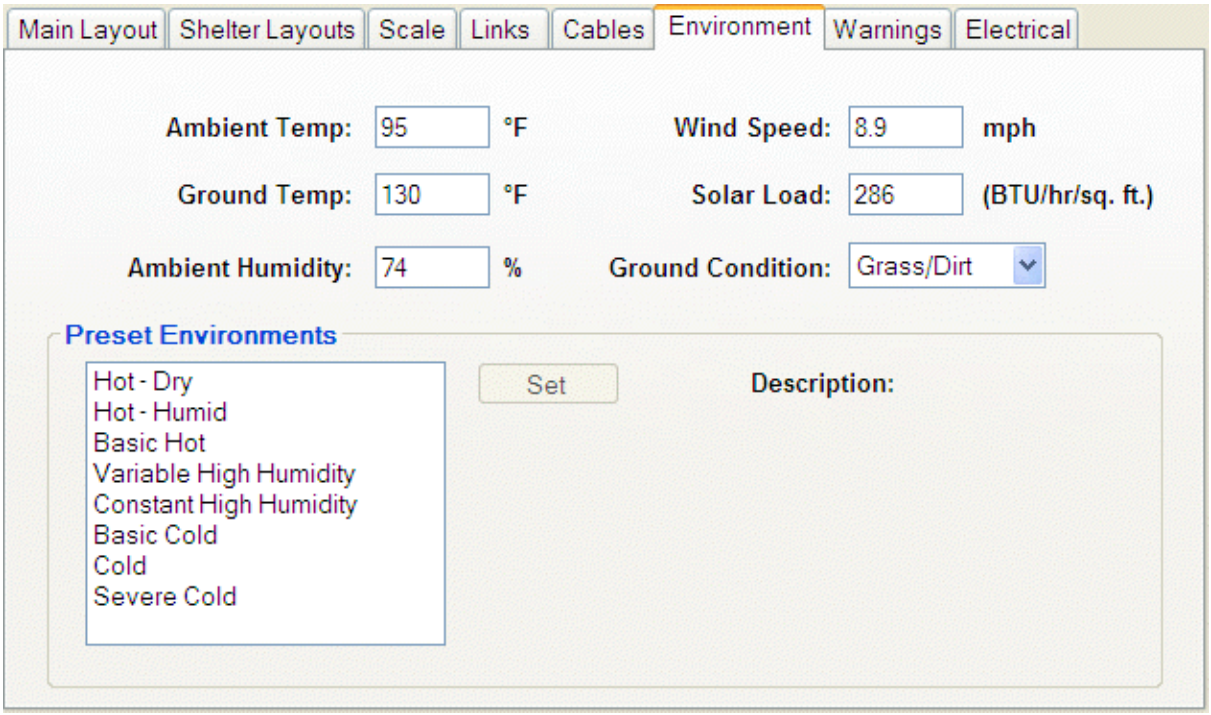
2. "**Suggest cables from specified list**"- This option allows the user to specify a limited cable list from which the cable suggestion algorithm should pull its suggestions. This is particularly useful in cases where the types of cables available for a layout are limited by reality. See suggested cables for detailed information on the cable suggestion algorithm.

- **If adapter is required for a 3ph cable, suggest adapter so that the remainder of the cable is of what type?** - Cables that have a MILSPEC connector type on one end and an IEC-309 connector type on the other require a MILSPEC-to-IEC-309 adapter with the remaining cable either MILSPEC or IEC-309. The user may here specify which cable type should comprise the remaining cable in such situations.

13.8.6 Environment Properties

The Environment tab of the Layout Properties window contains information about the natural environment for the layout. The information in this tab is utilized by the HVAC Requirements Calculator and may be also accessed via the Environmental Conditions section of the HVAC Requirements Calculator window.

The tab is shown below:



The Environment Tab of the Layout Properties Window

- **Ambient Temp:** The ambient temperature, in degrees Fahrenheit.
- **Ground Temperature:** The ground temperature, in degrees Fahrenheit.
- **Ambient Humidity:** The ambient humidity, as a percentage.

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- **Wind Speed:** Wind speed in miles per hour.
- **Solar Load:** A measure of the heating ability of the sun (short wave solar radiation) on a surface, measured in BTU/hr/sq. ft. This value can be found in climatic condition manuals such as Army Regulation AR 70-38*, Research, Development, Test and Evaluation of Materiel For Extreme Climatic Conditions.*.
- **Ground Condition:** The type of ground surface. Options include Grass/Dirt, Sand or Frozen.

Preset Environments

AutoDISE provides 8 preset environments that can be used if environmental conditions are not available. These are extreme values for particular climates in the world that can be used for design purposes. Selecting a preset environment from the list in the Preset Environments section will make visible a description of the selected environment. The options and descriptions are shown below.

Environment	Description
Hot - Dry	Hot-Dry conditions are found seasonally in the deserts of Northern Africa, the Middle East, Pakistan and India, Southwestern United States, and Northern Mexico. The extreme condition takes place at 1600 hours.
Hot - Humid	Hot-Humid conditions occur along narrow strips bordering bodies of water with high surface temperatures, specifically the Persian Gulf and the Red Sea. The extreme condition takes place at 1300 hours.
Basic Hot	Basic Hot conditions exist in many parts of the world extending outward from the areas of Hot-Dry conditions in the United States, Mexico, Africa, Asia and Australia. They also occur in Southern Africa, South America, Southern Spain, and in Southwest Asia. The extreme condition takes place at 1400 hours.
Variable High Humidity	High Humidity conditions are found most often in tropical areas, although they occur briefly or seasonally in the mid-latitudes. Variable High Humidity represents conditions found in the open in tropical areas. The extreme condition takes place at 1400 hours.
Constant High Humidity	High Humidity conditions are found most often in tropical areas, although they occur briefly or seasonally in the mid-latitudes. Constant High Humidity represents conditions in the heavily forested areas where nearly constant conditions may prevail during rainy and wet seasons. The extreme condition takes place between 2100 and 0600 hours.

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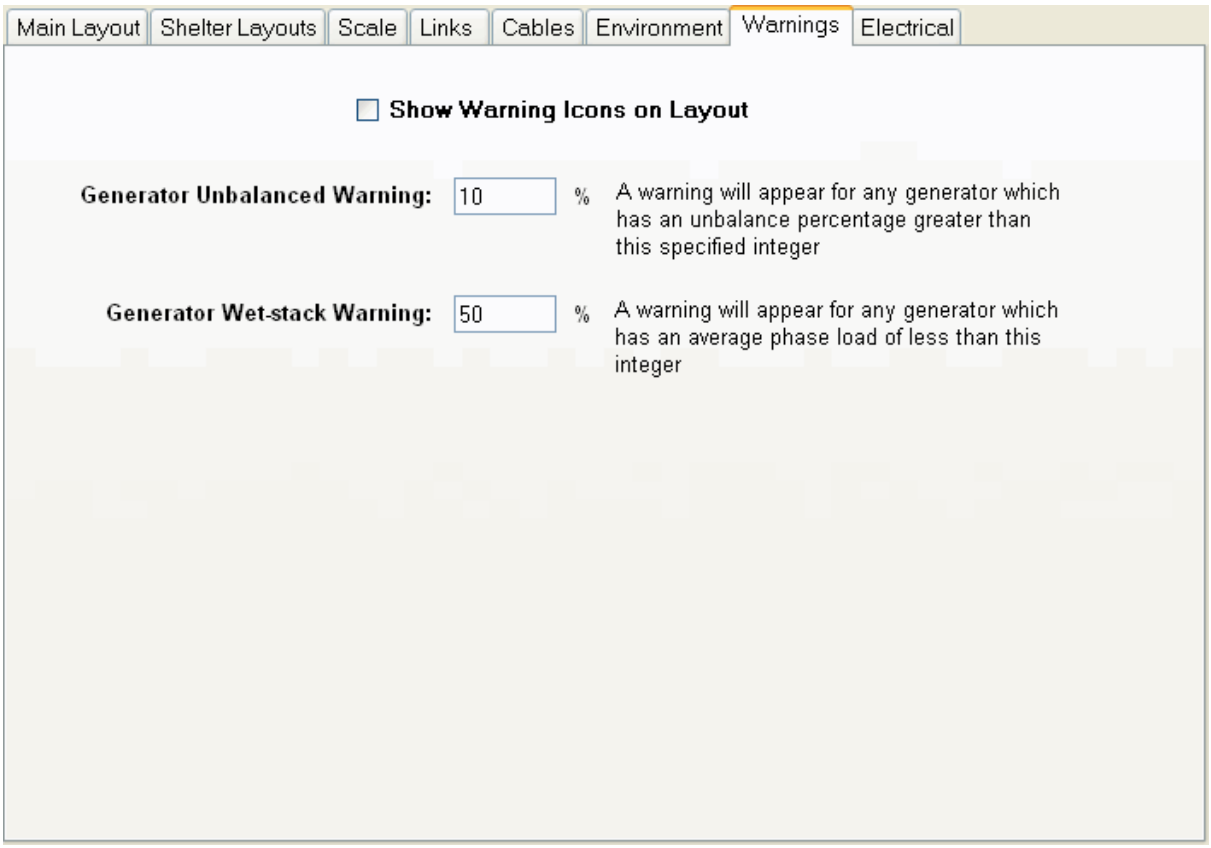
Basic Cold	Basic Cold conditions are found only in the Northern Hemisphere south of the coldest areas and on high latitude coasts (e.g., the southern coast of Alaska), where maritime effects prevent occurrence of very low temperatures. The extreme condition takes place between 0200 and 0600 hours.
Cold	Cold conditions are found in the Northern Hemisphere in Canada, Alaska, Greenland, Northern Scandinavia, Northern Asia and Tibet. Very small areas of the Cold type may be found at higher elevations in both the Northern and Southern Hemisphere (e.g., Alps, Himalayas, and the Andes). The extreme condition takes place between 0100 and 0600 hours.
Severe Cold	Severe Cold conditions are found in the Northern Hemisphere in the interior of Alaska, extending in to the Yukon in Canada. They also exist in the interior of the northern islands of the Canadian Archipelago, on the Greenland icecap, and in Northern Asia. The extreme condition takes place throughout the 24-hour period.

13.8.7 Warnings Properties

The Warnings tab of the Layout Properties window contains information that is required to determine if particular warnings should be shown. The tab is shown below:



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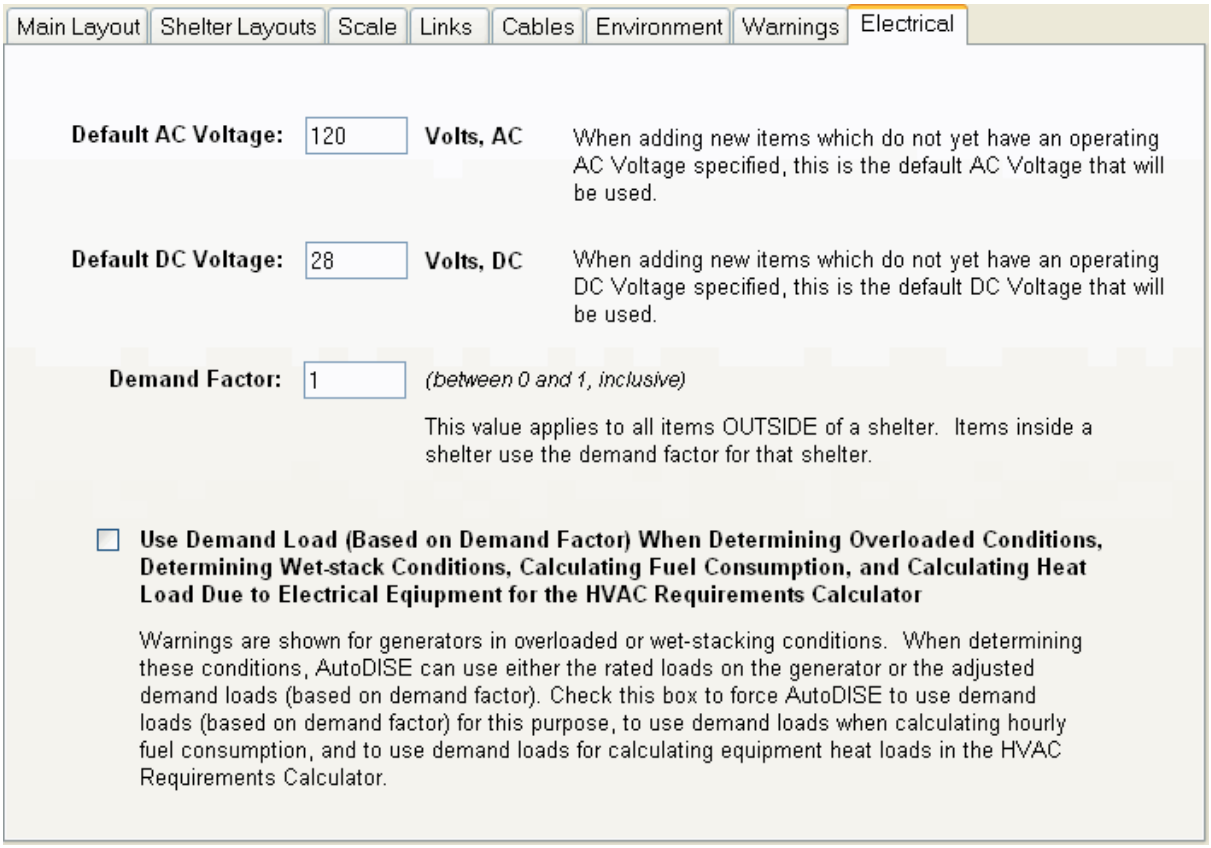
The Warnings Tab of the Layout Properties Window

- **Show Warning Icons on Layout**: Checking this option ensures that all warning icons appear on this layout, including all overload and wet-stacking warnings.
- **Generator Unbalanced Warning:** This threshold value determines if a generator unbalanced warning appears over a generator icon. A warning will appear for any generator which has an unbalance percentage greater than this specified integer.
- **Generator Wet-stack warning:** This threshold value determines if a generator wet-stack warning appears over a generator icon. A warning will appear for any generator which has an average phase load of less than this integer.
- **Use Demand Load (Based on Demand Factor) When Determining Overloaded or Wet-stack Conditions and When Calculating Fuel Consumption**: Warnings are shown for generators in overloaded or wet-stacking conditions. When determining these conditions, AutoDISE can use either the rated loads on the generator or the adjusted demand loads (based on demand factor). Check this box to force AutoDISE to use demand loads (based on demand factor) for this purpose, and to use demand loads when calculating hourly fuel consumption.

13.8.8 Electrical Properties

The Electrical tab of the Layout Properties window contains information that specifies electrical properties of the layout. The tab is shown below:


Main Layout
Shelter Layouts
Scale
Links
Cables
Environment
Warnings
Electrical
Default AC Voltage:
120
Volts, AC
When adding new items which do not yet have an operating AC Voltage specified, this is the default AC Voltage that will be used.
Default DC Voltage:
28
Volts, DC
When adding new items which do not yet have an operating DC Voltage specified, this is the default DC Voltage that will be used.
Demand Factor:
1
(between 0 and 1, inclusive)
This value applies to all items OUTSIDE of a shelter. Items inside a shelter use the demand factor for that shelter.
Use Demand Load (Based on Demand Factor) When Determining Overloaded Conditions, Determining Wet-stack Conditions, Calculating Fuel Consumption, and Calculating Heat Load Due to Electrical Eqiupment for the HVAC Requirements Calculator
Warnings are shown for generators in overloaded or wet-stacking conditions. When determining these conditions, AutoDISE can use either the rated loads on the generator or the adjusted demand loads (based on demand factor). Check this box to force AutoDISE to use demand loads (based on demand factor) for this purpose, to use demand loads when calculating hourly fuel consumption, and to use demand loads for calculating equipment heat loads in the HVAC Requirements Calculator.

The Electrical Tab of the Layout Properties Window

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- **Default AC Voltage:** This value is used by the system when adding new items which do not yet have an operating AC Voltage specified. This value is used by default.
- **Default DC Voltage:** This value is used by the system when adding new items which do not yet have an operating DC Voltage specified. This value is used by default.
- **Demand Factor**: Enter here a demand factor to be applied to all items outside of a shelter. Items inside a shelter use the demand factor for that shelter.
- **Use Demand Load (Based on Demand Factor) When Determining Overloaded Conditions, Determining Wet-stack Conditions, Calculating Fuel Consumption, and Calculating Heat Load Due to Electrical Eqiupment for the HVAC Requirements Calculator**: Warnings are shown for generators in overloaded or wet-stacking conditions. When determining these conditions, AutoDISE can use either the rated loads on the generator or the adjusted demand loads (based on demand factor). Check this box to force AutoDISE to use demand loads (based on demand factor) for this purpose, to use demand loads when calculating hourly fuel consumption, and to use demand loads for calculating equipment heat loads in the HVAC Requirements Calculator..

13.9 Default Layout Properties

The **Default Layout Properties** window defines the layout properties that new layouts will use as their defaults and what existing layouts will change to if the user opens the Layout Properties window for a particular layout clicks on the **Restore User Defaults** button.

The **Default Layout Properties** window may be opened by selecting **Default Layout Properties** from the Layout Menu.

The window has the following tabs:

- Main Layout
- Shelter Layouts
- Scale
- Links
- Electrical Cables
- Environment
- Warnings
- Electrical

The **Default Layout Properties** contains a **Restore System Defaults** button which restores all default properties to the system defaults. Absolutely NO changes are saved, including restored system defaults, until the **Save** button is clicked.

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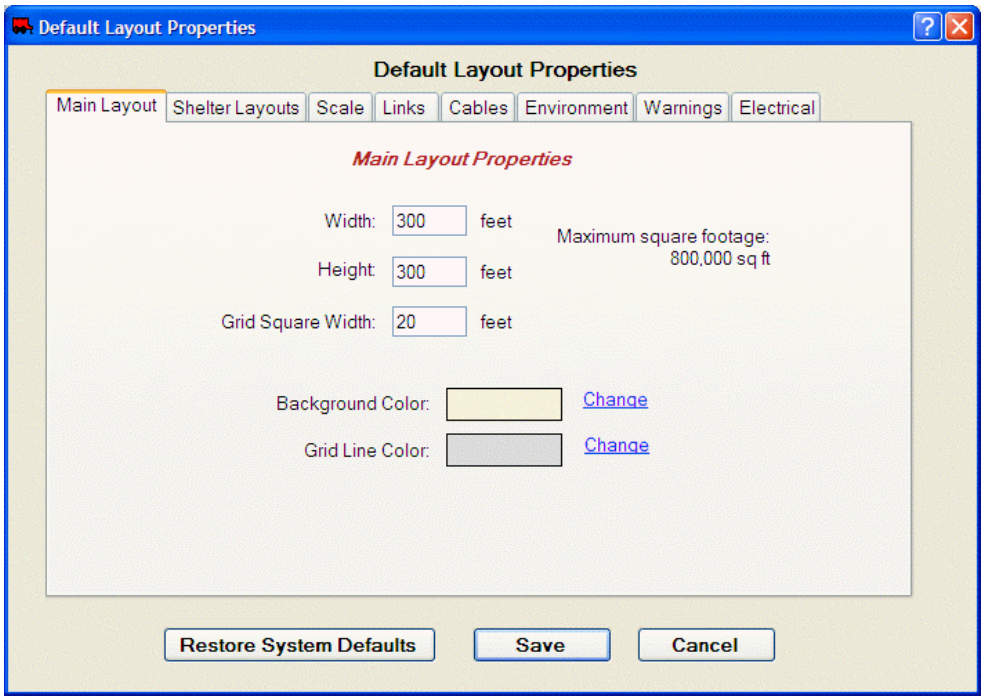
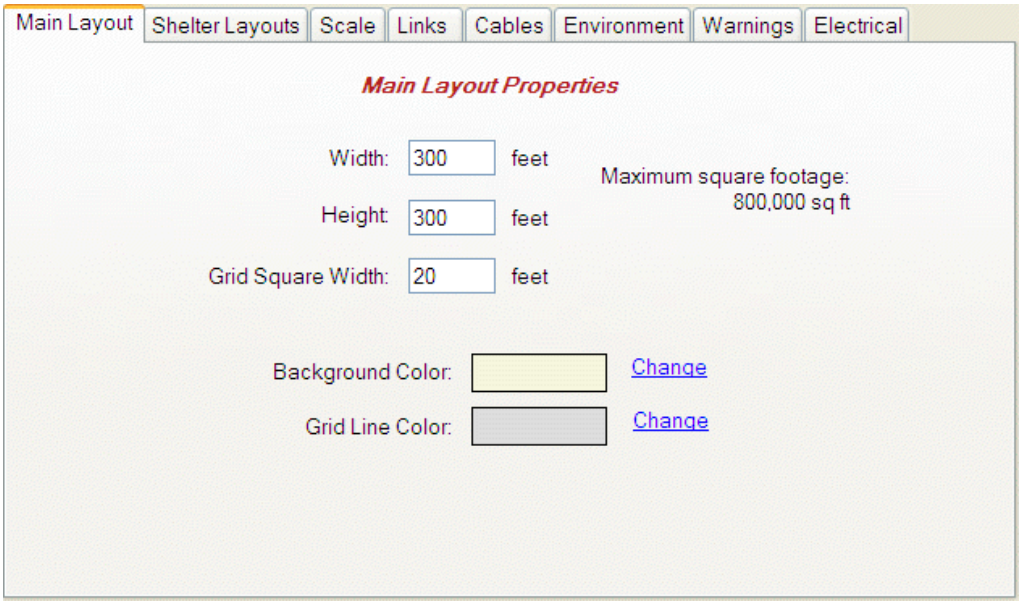


Default Layout Properties Window

13.9.1 Main Layout Properties

The **Main Layout** tab of the Default Layout Properties window contains properties that ONLY affect the main layout view. The tab is shown below:



The Main Layout Tab of the Default Layout Properties Window

- **Width:** The main layout width, in feet
- **Height:** The main layout height, in feet

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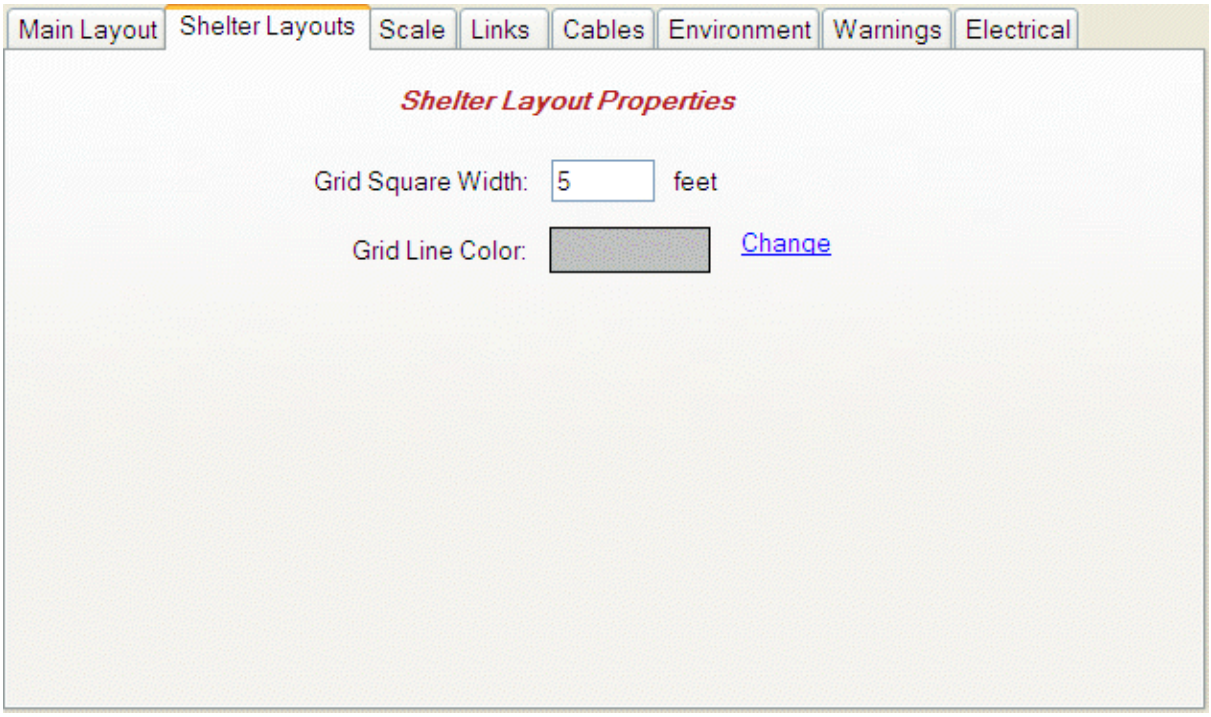
Note: Currently, the main layout has a maximum square footage of 800,000 sq. ft. Future versions of AutoDISE will most likely allow much larger layouts.

- **Grid Square Width:** The distance, in feet, between grid lines on the main layout
- **Background Color:** The color of the main layout background
- **Grid Line Color:** The color of the main layout grid lines

13.9.2 Shelter Layout Properties

The **Shelter Layouts** tab of the Default Layout Properties window contains properties that ONLY affect the shelter layout views. The tab is shown below:



The Shelter Layouts Tab of the Default Layout Properties Window

- **Grid Square Width:** The distance, in feet, between grid lines on shelter layouts
- **Grid Line Color:** The color of shelter layout grid lines

13.9.3 Scale Properties

The **Scale** tab of the Default Layout Properties window contains properties that affect both the main layout view AND all shelter layout views. The tab is shown below:

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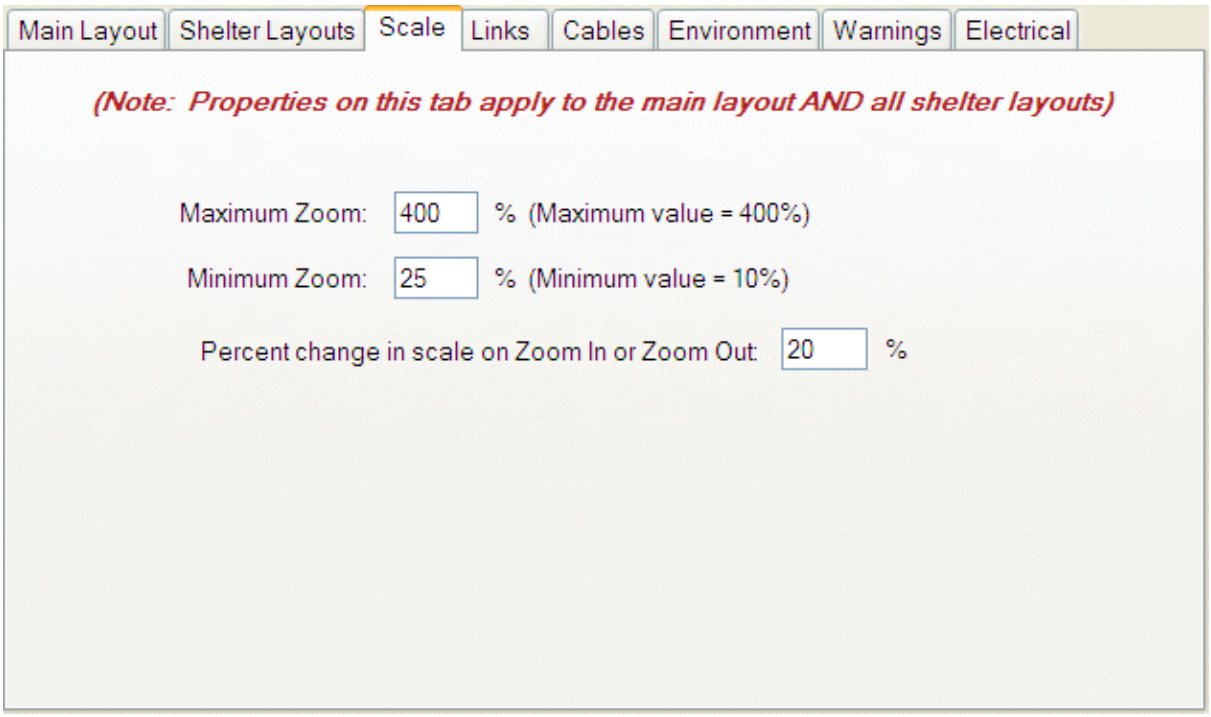
Main Layout
Shelter Layouts
Scale
Links
Cables
Environment
Warnings
Electrical
(Note: Properties on this tab apply to the main layout AND all shelter layouts)
Maximum Zoom: 400 % (Maximum value = 400%)
Minimum Zoom: 25 % (Minimum value = 10%)
Percent change in scale on Zoom In or Zoom Out: 20 %

The Scale Tab of the Default Layout Properties Window

- **Maximum Zoom:** The maximum zoom allowed, as a percentage. For shelter layout views, 100% zoom is defined as the zoom when the shelter layout is opened and maximized to fit within the current screen.
- **Minimum Zoom:** The minimum zoom allowed, as a percentage. For shelter layout views, 100% zoom is defined as the zoom when the shelter layout is opened and maximized to fit within the current screen.
- **Percent change in scale on Zoom In or Zoom Out:** When a user uses the Zoom In or Zoom Out modes to zoom a layout, the zoom changes by the specified percent.

13.9.4 Links Properties

The **Links** tab of the Default Layout Properties window contains properties that affect both the main layout view AND all shelter layout views. The tab is shown below:

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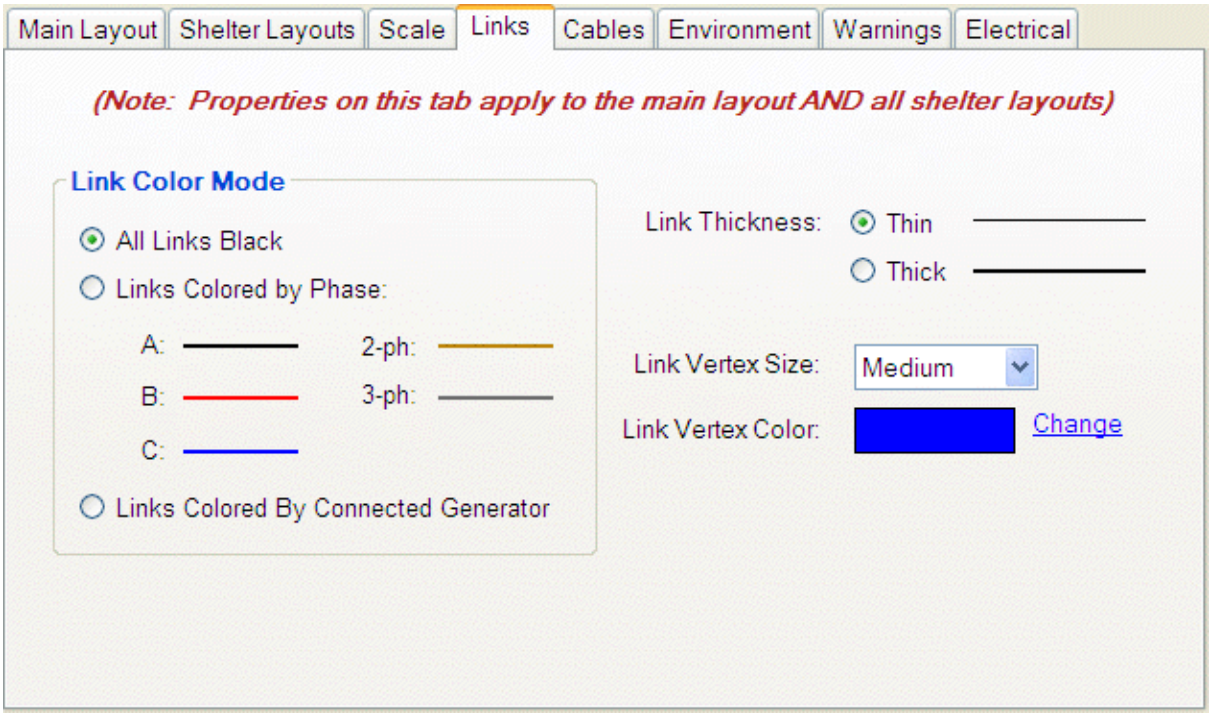

The Links Tab of the Default Layout Properties Window

- **Link Color Mode:** This specifies the color scheme for drawing links on all layouts:

    1. All Links Black - all links are drawn in black
    2. Links Colored by Phase - links are drawn the color which specifies either the number of phases in the link, or, for single phase links, the generator phase of the current carried by the link
    3. Links Colored By Connected Generator - When multiple generators exists on a layout, links for each generator are drawn a different color.

- **Link Thickness:** Specify the thickness of all links to be thin or thick
- **Link Vertex Size:** Specify the size of link vertices as small, medium or large
- **Link Vertex Color:** Specify the color for link vertices

13.9.5 Electrical Cables Properties

The **Electrical Cables** tab of the Default Layout Properties window contains properties that affect both the main layout view AND all shelter layout views. The tab is shown below:

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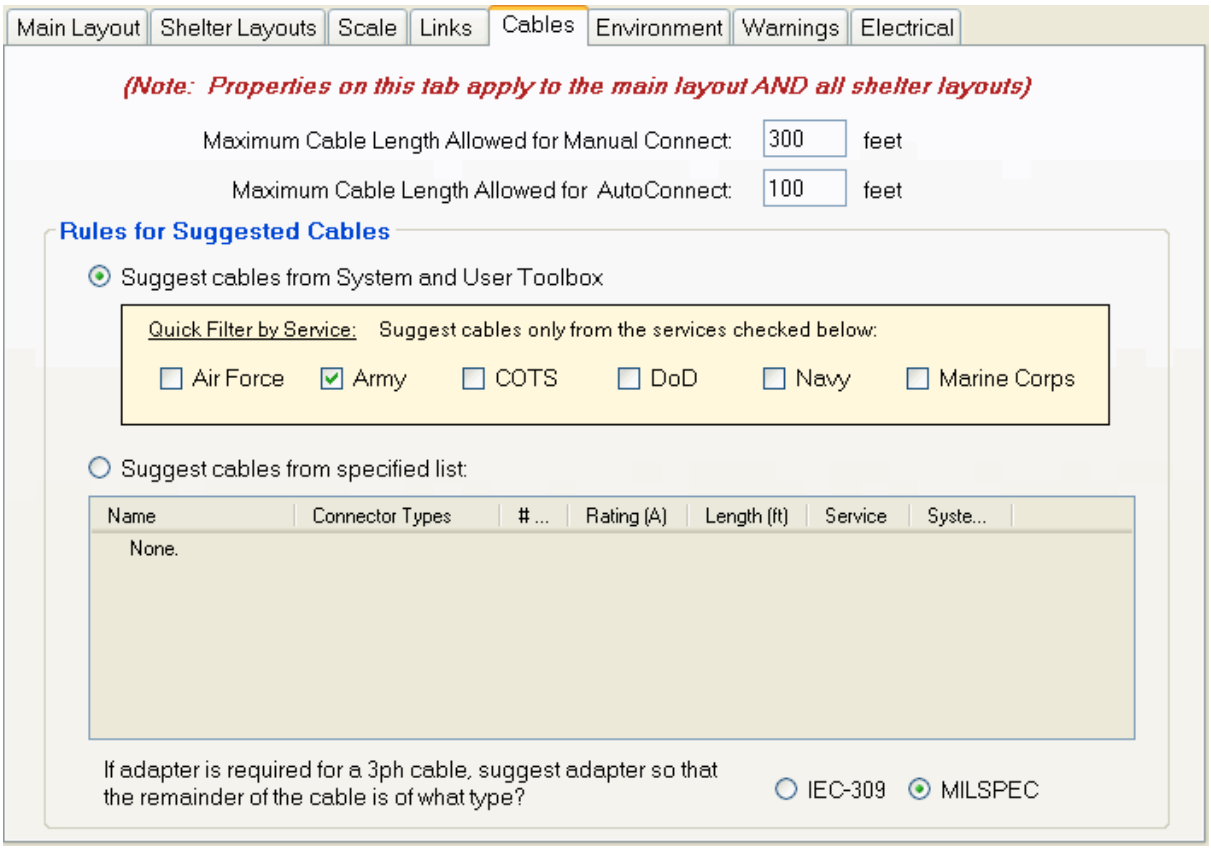

The Electrical Cables Tab of the Default Layout Properties Window

- **Maximum Cable Length Allowed for Manual Connect:** When connecting two items using manual connect, AutoDISE will limit the allowed length of the link to the specified value.

  Note: this does NOT prevent the user from moving two items closer, linking them, then moving them back to their original location such that the end result is a link greater than the specified amount. The purpose of this manual connect restriction is to flag the user that there is a length issue.

- **Maximum Cable Length Allowed for AutoConnect:** This specifies the maximum cable length that AutoConnect will allow when running the AutoConnect algorithm.

- **Rules for Suggested Cables:** Suggested cables are utilized when viewing the Link Properties window, when populating cable entries in an Inventory View, and when calculating voltage drops between items. Two parameters may be set by the user to affect which cables are suggested for links:

  1. **"Suggest cables from System and User Toolbox" -** This option forces the cable suggestion algorithm to select from all cables in the System and User Toolbox, with the option to filter cables from specific services, as shown in the **Quick Filter by Service** options directly below. See suggested cables for detailed information on the

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cable suggestion algorithm.

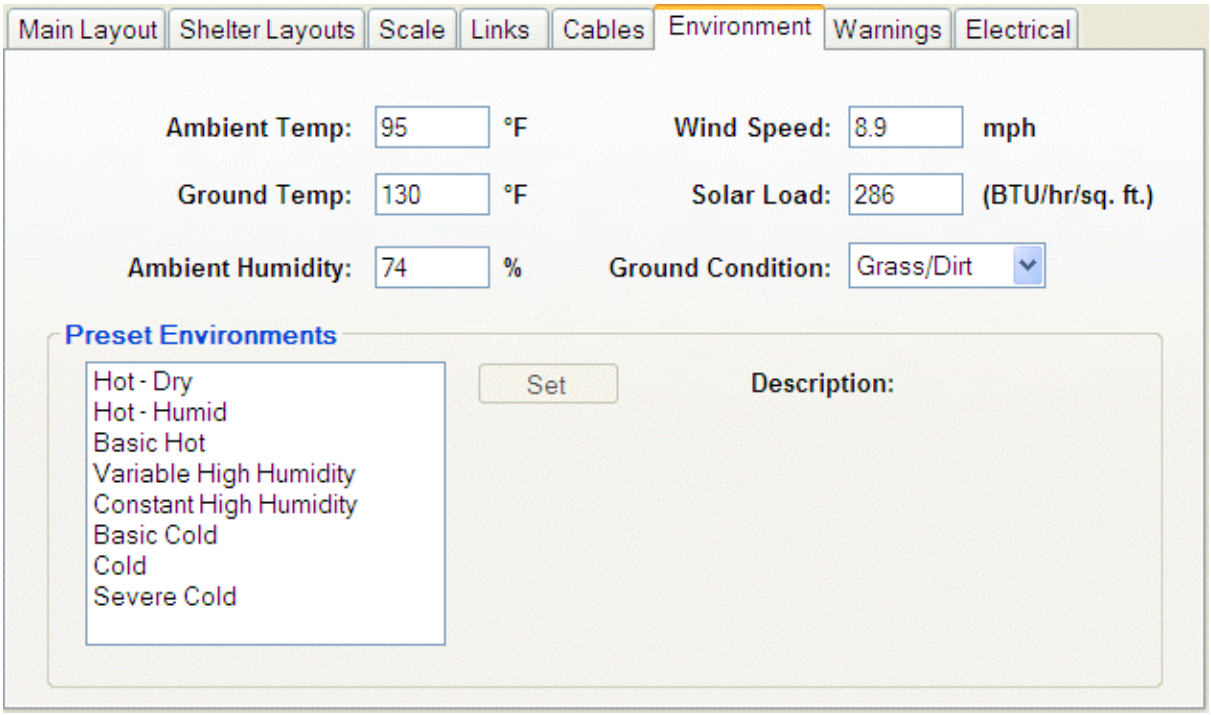
2. "**Suggest cables from specified list**"- This option allows the user to specify a limited cable list from which the cable suggestion algorithm should pull its suggestions. This is particularly useful in cases where the types of cables available for a layout are limited by reality. See suggested cables for detailed information on the cable suggestion algorithm.

- **If adapter is required for a 3ph cable, suggest adapter so that the remainder of the cable is of what type?** - Cables that have a MILSPEC connector type on one end and an IEC-309 connector type on the other require a MILSPEC-to-IEC-309 adapter with the remaining cable either MILSPEC or IEC-309. The user may here specify which cable type should comprise the remaining cable in such situations

13.9.6 Environment Properties

The Environment tab of the Default Layout Properties window contains information about the natural environment for the layout. The information in this tab is utilized by the HVAC Requirements Calculator and may be also accessed via the Environmental Conditions section of the HVAC Requirements Calculator window.

The tab is shown below:



The Environment Tab of the Default Layout Properties Window

- **Ambient Temp:** The ambient temperature, in degrees Fahrenheit.
- **Ground Temperature:** The ground temperature, in degrees Fahrenheit.
- **Ambient Humidity:** The ambient humidity, as a percentage.

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- **Wind Speed:** Wind speed in miles per hour.
- **Solar Load:** A measure of the heating ability of the sun (short wave solar radiation) on a surface, measured in BTU/hr/sq. ft. This value can be found in climatic condition manuals such as Army Regulation AR 70-38*, Research, Development, Test and Evaluation of Materiel For Extreme Climatic Conditions.*
- **Ground Condition:** The type of ground surface. Options include Grass/Dirt, Sand or Frozen.

Preset Environments

AutoDISE provides 8 preset environments that can be used if environmental conditions are not available. These are extreme values for particular climates in the world that can be used for design purposes. Selecting a preset environment from the list in the Preset Environments section will make visible a description of the selected environment. The options and descriptions are shown below.

Environment	Description
Hot - Dry	Hot-Dry conditions are found seasonally in the deserts of Northern Africa, the Middle East, Pakistan and India, Southwestern United States, and Northern Mexico. The extreme condition takes place at 1600 hours.
Hot - Humid	Hot-Humid conditions occur along narrow strips bordering bodies of water with high surface temperatures, specifically the Persian Gulf and the Red Sea. The extreme condition takes place at 1300 hours.
Basic Hot	Basic Hot conditions exist in many parts of the world extending outward from the areas of Hot-Dry conditions in the United States, Mexico, Africa, Asia and Australia. They also occur in Southern Africa, South America, Southern Spain, and in Southwest Asia. The extreme condition takes place at 1400 hours.
Variable High Humidity	High Humidity conditions are found most often in tropical areas, although they occur briefly or seasonally in the mid-latitudes. Variable High Humidity represents conditions found in the open in tropical areas. The extreme condition takes place at 1400 hours.
Constant High Humidity	High Humidity conditions are found most often in tropical areas, although they occur briefly or seasonally in the mid-latitudes. Constant High Humidity represents conditions in the heavily forested areas where nearly constant conditions may prevail during rainy and wet seasons. The extreme condition takes place between 2100 and 0600 hours.

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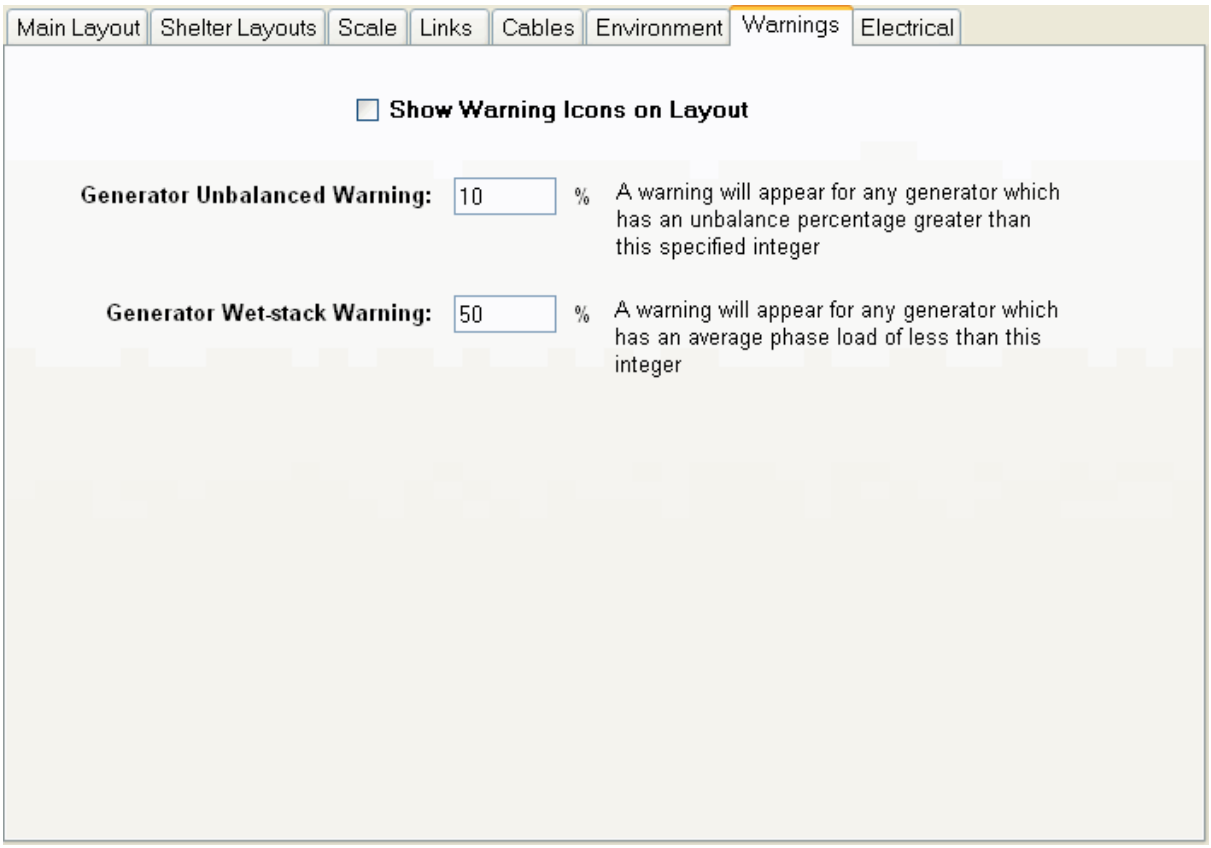
Basic Cold	Basic Cold conditions are found only in the Northern Hemisphere south of the coldest areas and on high latitude coasts (e.g., the southern coast of Alaska), where maritime effects prevent occurrence of very low temperatures. The extreme condition takes place between 0200 and 0600 hours.
Cold	Cold conditions are found in the Northern Hemisphere in Canada, Alaska, Greenland, Northern Scandinavia, Northern Asia and Tibet. Very small areas of the Cold type may be found at higher elevations in both the Northern and Southern Hemisphere (e.g., Alps, Himalayas, and the Andes). The extreme condition takes place between 0100 and 0600 hours.
Severe Cold	Severe Cold conditions are found in the Northern Hemisphere in the interior of Alaska, extending in to the Yukon in Canada. They also exist in the interior of the northern islands of the Canadian Archipelago, on the Greenland icecap, and in Northern Asia. The extreme condition takes place throughout the 24-hour period.

13.9.7 Warnings Properties

The Warnings tab of the Default Layout Properties window contains information that is required to determine if particular warnings should be shown. The tab is shown below:



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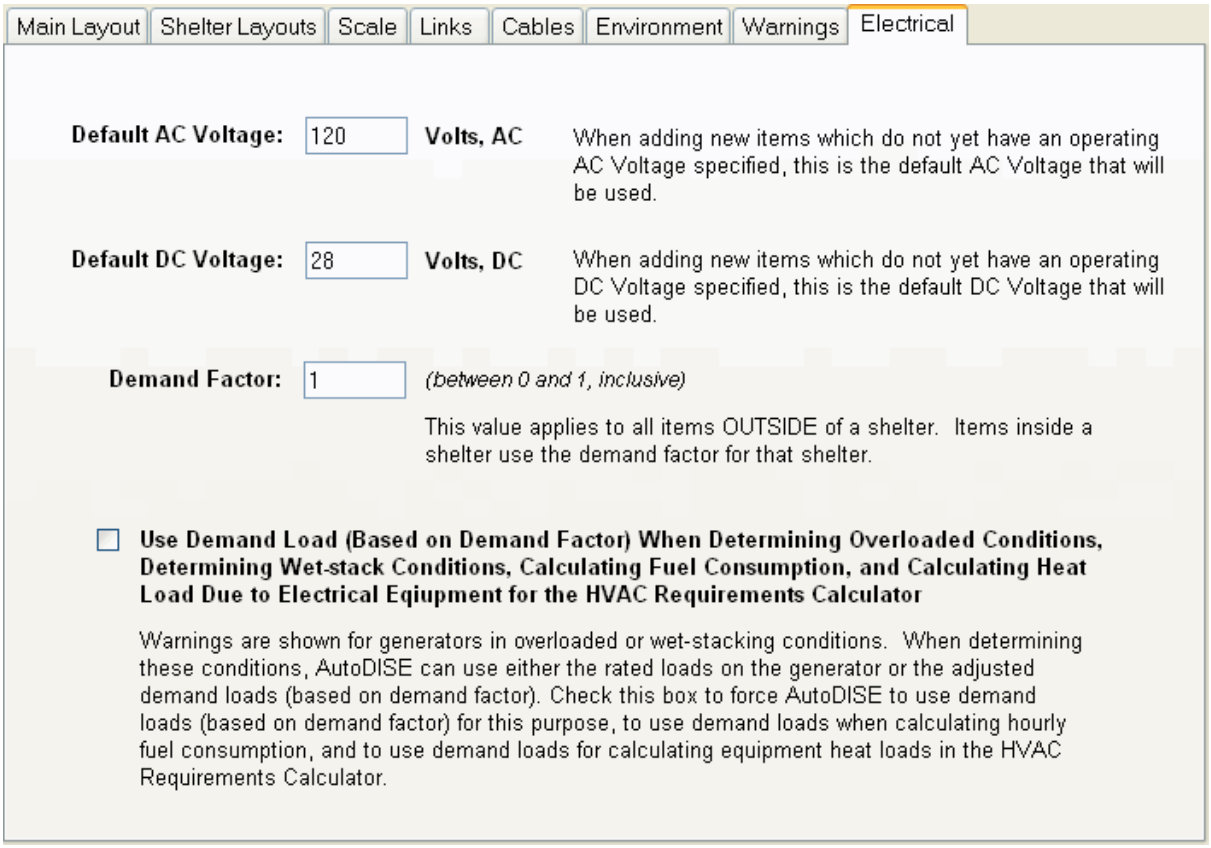
The Warnings Tab of the Default Layout Properties Window

- **Show Warning Icons on Layout**: Checking this option ensures that all warning icons appear on this layout, including all overload and wet-stacking warnings.
- **Generator Unbalanced Warning:** This threshold value determines if a generator unbalanced warning appears over a generator icon. A warning will appear for any generator which has an unbalance percentage greater than this specified integer.
- **Generator Wet-stack warning:** This threshold value determines if a generator wet-stack warning appears over a generator icon. A warning will appear for any generator which has an average phase load of less than this integer.
- **Use Demand Load (Based on Demand Factor) When Determining Overloaded or Wet-stack Conditions and When Calculating Fuel Consumption**: Warnings are shown for generators in overloaded or wet-stacking conditions. When determining these conditions, AutoDISE can use either the rated loads on the generator or the adjusted demand loads (based on demand factor). Check this box to force AutoDISE to use demand loads (based on demand factor) for this purpose, and to use demand loads when calculating hourly fuel consumption.

13.9.8 Electrical Properties

The Electrical tab of the Default Layout Properties window contains information that specifies electrical properties of the layout. The tab is shown below::


Main Layout
Shelter Layouts
Scale
Links
Cables
Environment
Warnings
Electrical
Default AC Voltage:
120
Volts, AC
When adding new items which do not yet have an operating AC Voltage specified, this is the default AC Voltage that will be used.
Default DC Voltage:
28
Volts, DC
When adding new items which do not yet have an operating DC Voltage specified, this is the default DC Voltage that will be used.
Demand Factor:
1
(between 0 and 1, inclusive)
This value applies to all items OUTSIDE of a shelter. Items inside a shelter use the demand factor for that shelter.
Use Demand Load (Based on Demand Factor) When Determining Overloaded Conditions, Determining Wet-stack Conditions, Calculating Fuel Consumption, and Calculating Heat Load Due to Electrical Eqiupment for the HVAC Requirements Calculator
Warnings are shown for generators in overloaded or wet-stacking conditions. When determining these conditions, AutoDISE can use either the rated loads on the generator or the adjusted demand loads (based on demand factor). Check this box to force AutoDISE to use demand loads (based on demand factor) for this purpose, to use demand loads when calculating hourly fuel consumption, and to use demand loads for calculating equipment heat loads in the HVAC Requirements Calculator.

The Electrical Tab of the Default Layout Properties Window

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- **Default AC Voltage:** This value is used by the system when adding new items which do not yet have an operating AC Voltage specified. This value is used by default.
- **Default DC Voltage:** This value is used by the system when adding new items which do not yet have an operating DC Voltage specified. This value is used by default.
- **Demand Factor**: Enter here a demand factor to be applied to all items outside of a shelter. Items inside a shelter use the demand factor for that shelter.
  - **Use Demand Load (Based on Demand Factor) When Determining Overloaded Conditions, Determining Wet-stack Conditions, Calculating Fuel Consumption, and Calculating Heat Load Due to Electrical Eqiupment for the HVAC Requirements Calculator**: Warnings are shown for generators in overloaded or wet-stacking conditions. When determining these conditions, AutoDISE can use either the rated loads on the generator or the adjusted demand loads (based on demand factor). Check this box to force AutoDISE to use demand loads (based on demand factor) for this purpose, to use demand loads when calculating hourly fuel consumption, and to use demand loads for calculating equipment heat loads in the HVAC Requirements Calculator..

13.10 Link Properties

The **Link Properties** window contains detailed information about a specific link.

The **Link Properties** window may be opened by right-clicking on a link and selecting **Properties** from the menu that appears.

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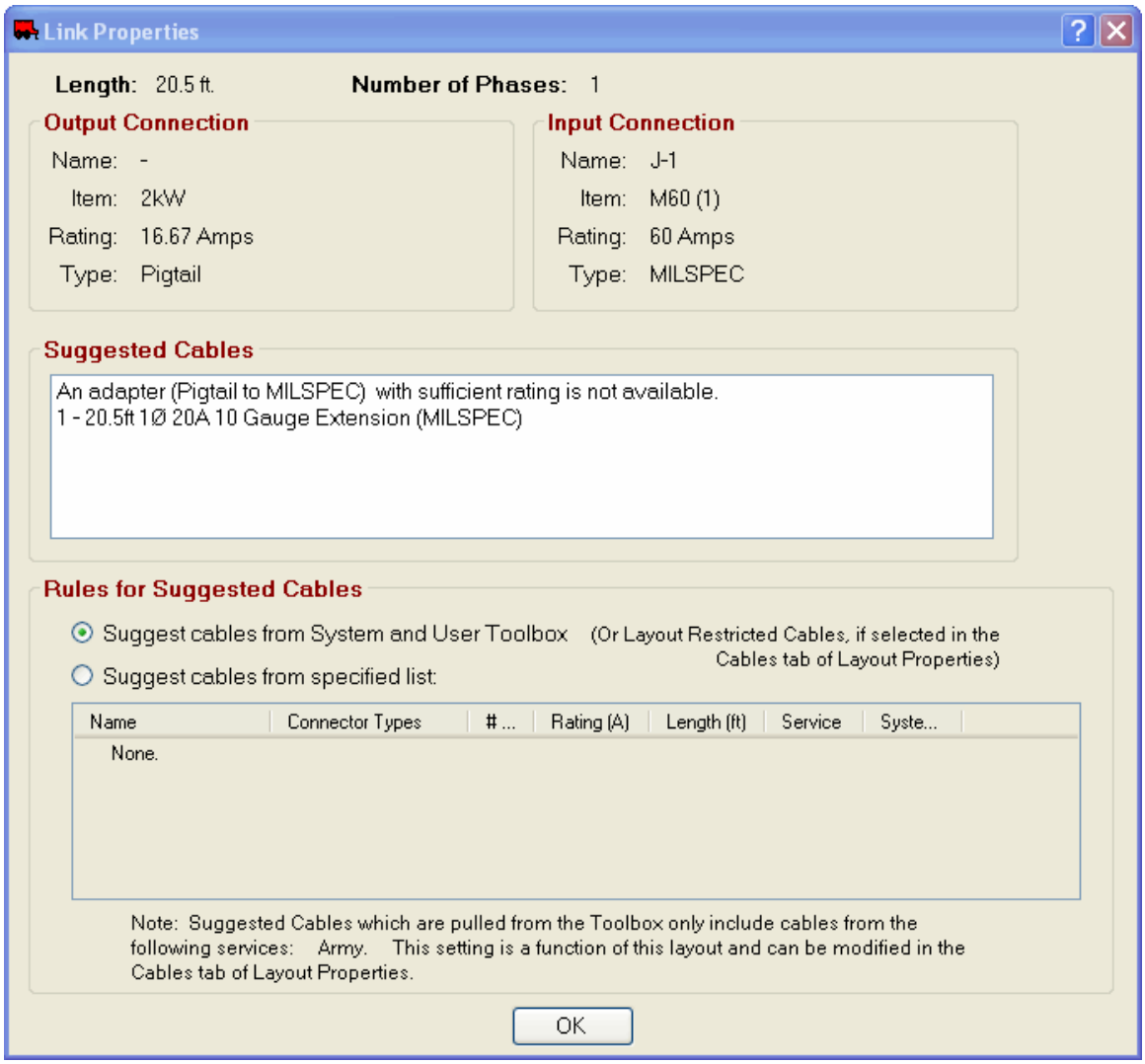
Link Properties
Length: 20.5 ft.
Number of Phases: 1
Output Connection
Name: -
Item: 2kW
Rating: 16.67 Amps
Type: Pigtail
Input Connection
Name: J-1
Item: M60 (1)
Rating: 60 Amps
Type: MILSPEC
Suggested Cables
An adapter (Pigtail to MILSPEC) with sufficient rating is not available.
1 - 20.5ft 1Ø 20A 10 Gauge Extension (MILSPEC)
Rules for Suggested Cables
Suggest cables from System and User Toolbox
(Or Layout Restricted Cables, if selected in the Cables tab of Layout Properties)
Suggest cables from specified list:
Name
Connector Types
...
Rating (A)
Length (ft)
Service
Syste...
None.
Note: Suggested Cables which are pulled from the Toolbox only include cables from the following services: Army. This setting is a function of this layout and can be modified in the Cables tab of Layout Properties.
OK

Link Properties Window

- **Number of Phases:** The number of phases carried by this link
- **Length:** The length of this link, in feet
- **Output and Input Connections:**

    1. Name: The name of the connection

        Note: Some connections, such as those connected by pigtail, do not have a nameplate name and are therefore marked with a "-".

    2. Item: The name of the item to which the connection belongs
    3. Rating: The rating, in Amps, of the connection
    4. Type: The connector type of the connection

        Note: Some connections, such as those for consumers, have an unspecified connector type and are therefore shown with a "-".

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- **Suggested Cables:** Provides a list of suggested cables for this link. See Suggested Cables.
- **Rules for Suggested Cables:** Suggested cables are utilized when viewing the Link Properties window, when populating cable entries in an Inventory View, and when calculating voltage drops between items. Two parameters may be set by the user to affect which cables are suggested for links:

  1. **"Suggest cables from System and User Toolbox" -** This option forces the cable suggestion algorithm to select from all cables in the System and User Toolbox.

  2. "**Suggest cables from specified list**"- This option allows the user to specify a limited cable list from which the cable suggestion algorithm should pull its suggestions. This is particularly useful in cases where the types of cables available for a link are limited by reality. See suggested cables for detailed information on the cable suggestion algorithm.

13.11 Options

The **Options** window allows the user to set preferences that apply to all users of AutoDISE on the client machine.

Open the **Options** window by selecting **Options** from the Tools Menu.

The **Options** window is shown below. The window has three tabs:

- Updates
- Startup
- Other

Updates Tab

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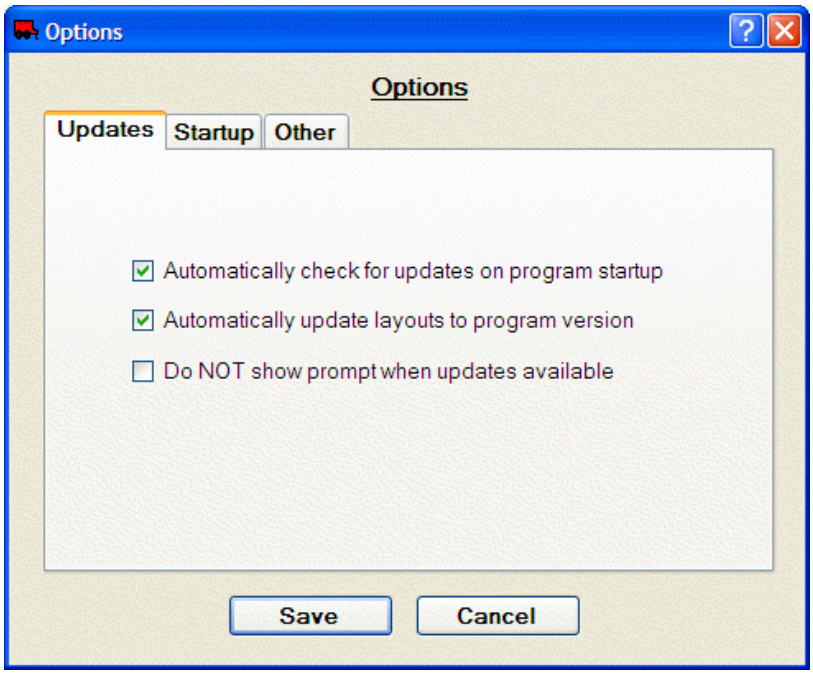

Options Window - Updates Tab

- **Automatically check for updates on program startup:** Check if you want AutoDISE to check for program updates EVERY time AutoDISE is started up *Note: this option is disabled if running AutoDISE off of a CD-ROM.*

- **Automatically update layouts to program version:** Check if you want AutoDISE to automatically update layouts being opened if they are of a version which is older than the current version of AutoDISE.

- **Do NOT show prompt when updates available:** Check if you do NOT want AutoDISE to show a prompt when program updates are available.

Startup Tab

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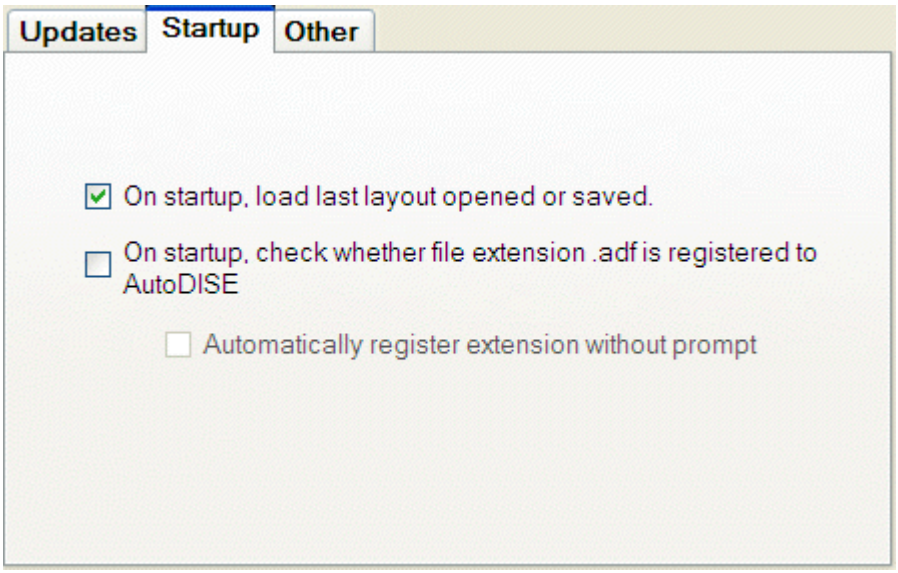
Updates
Startup
Other
On startup, load last layout opened or saved.
On startup, check whether file extension .adf is registered to AutoDISE
Automatically register extension without prompt

Options Window - Startup Tab

- **On startup, load last layout opened or saved:** Check if you want AutoDISE to automatically load the last layout that ANY user on the client machine either opened or saved.

- **On startup, check whether file extension .adf is registered to AutoDISE:** Since AutoDISE does not require any install, Microsoft Windows registry changes initially ***DO NOT*** exist which register the file extension ".adf" with the operating system. Such a registry permits users to simply double-click on a .adf file to open AutoDISE.

  AutoDISE has the ability to register the .adf extension and permit the double-click feature. Click this checkbox to check whether the registry requires changes to register the extension.

  If **Automatically register extension without prompt** is checked, this will happen automatically. Otherwise, the user will be prompted.

  Note: for registry changes to take place successfully, the user must have rights to make such changes. Some systems enforce policies which prevent such changes, especially if the user does not have administrative rights on the machine. In this event, AutoDISE layouts may only be opened by running AutoDISE and opening layouts from within the program.

Other Tab

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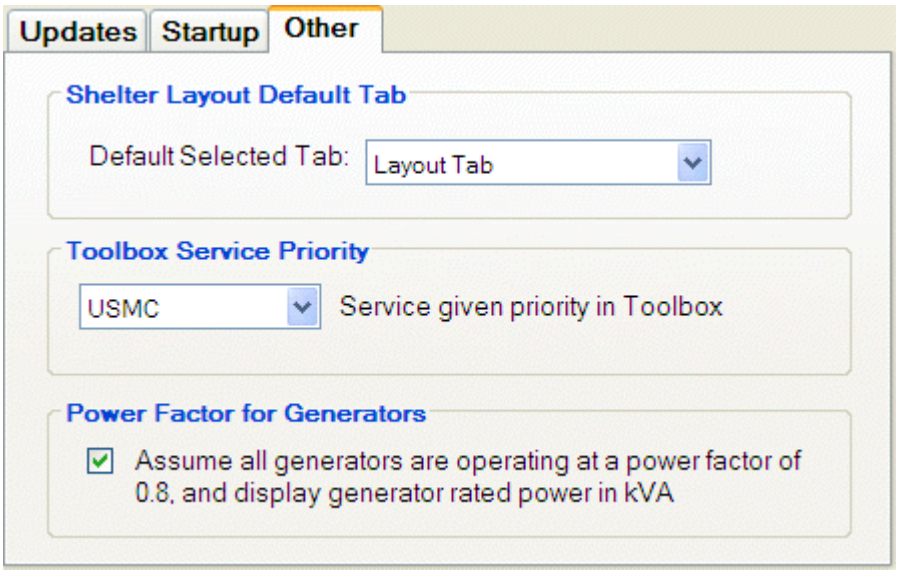

Options Window - Other Tab

- **Shelter Layout Default Selected Tab:** Select either the Layout tab or Tabular View tab as the default tab that is selected when a layout is opened.
- **Service given priority in Toolbox:** Select the service which should be ordered first in the Toolbox.
- **Power Factor for Generators:** Check if you wish to assume that all generators in any layout are operating at a power factor of 0.8. Checking this will also force all generator rated power displays to display in kVA.

13.12 Add Items From Toolbox

The **Add Items From Toolbox** window (also called the is used to locate items in the Toolbox using filters. This is especially useful if the Toolbox contains a large number of items and searching through all items at once becomes tedious.

Open the **Add Items From Toolbox** window by either clicking the **Add Items from Toolbox** button on the Main Toolbar, or selecting **Add Item from Toolbox** from the Layout Menu.

To add items to a layout, select the desired item from the top left list on the left. A brief description of the item will appear in the **Highlighted Item Summary** section. Then, click **Place** and move the cursor over the desired layout. Then, click on the layout to add the item. The **Close** button closes the window. The **Place and Close** button closes the window and allows you to place the selected item.

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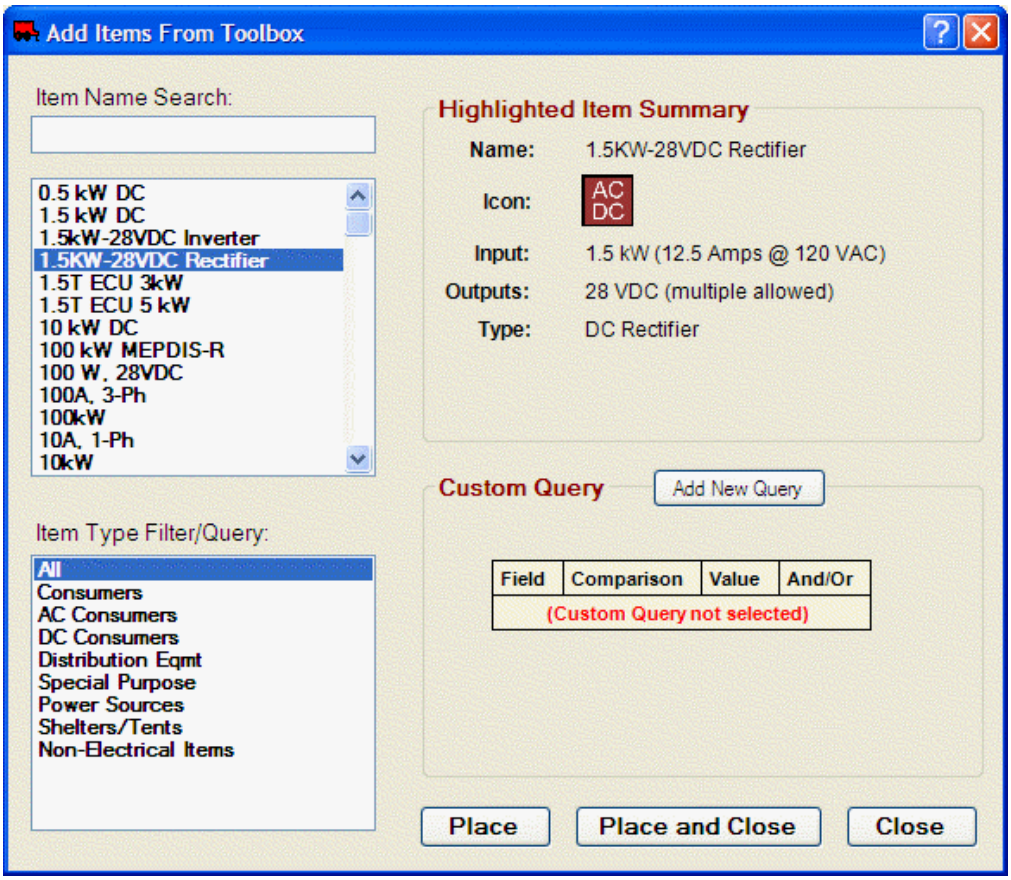

Add Items from Toolbox Window

- **Item Name Search:** Type the beginning letters of the item you wish to locate and the item list below this field will automatically jump down to the first entry that begins with those letters.

- **Item Type Filter/Query:** Provides a list of standard and user-defined queries (filters) that filter the main listing. For example, clicking on "Consumers" modifies the list above to only show consumers

- **Custom Query:** Allows the user to enter in their own query based on unique criteria.

    1. Adding a Custom Query: To add a new query, click the **Add New Query** button. See Add Custom Query window for more information on adding queries

    2. Editing a Custom Query: To edit an existing custom query, click on the query name in the **Item Type Filter/Query** box. The query details appear in the **Custom Query** section as in the figure below. To edit the query, click **Edit**. To delete the query, click **Delete.**

       See Edit Custom Query for more information.

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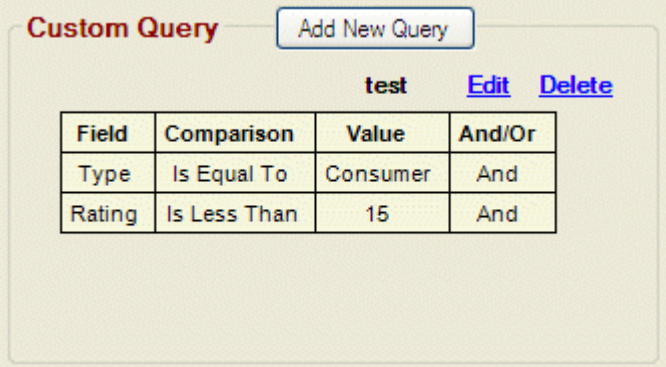
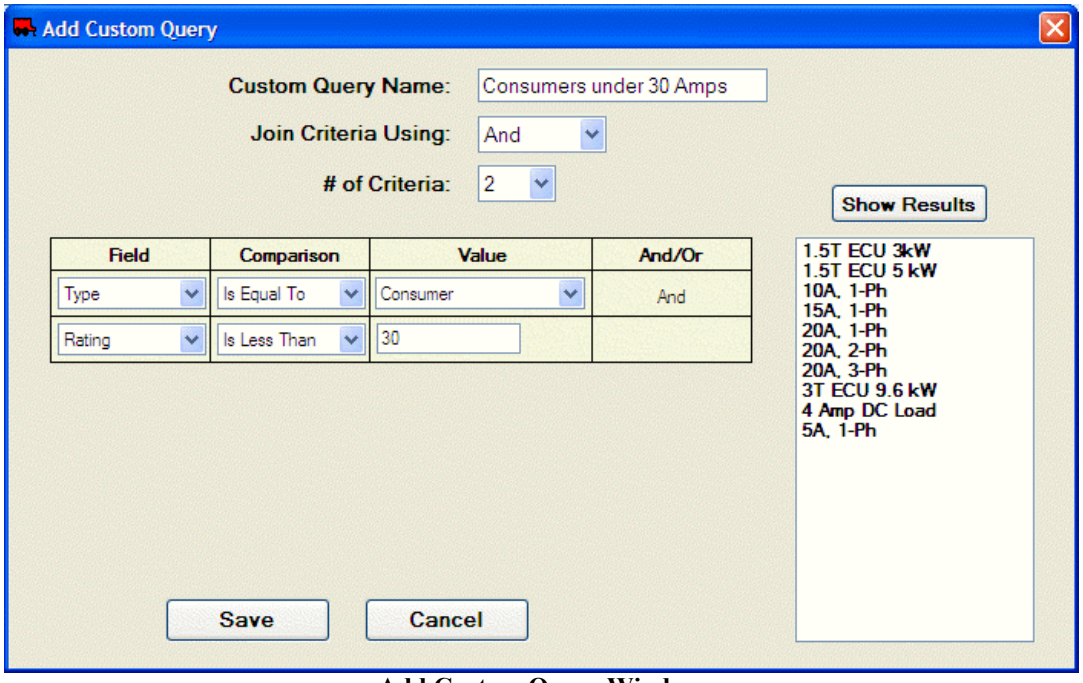


13.12.1 Add Custom Query

See Add Items From Toolbox for how to open the **Add Custom Query** window.

The **Add Custom Query** window is used to add a new query to the Toolbox. A query is simply a set of commands which instruct AutoDISE how to filter the items in the Toolbox for ease in locating desired items.

The custom query shown below demonstrates the features of this window. This query filters out all items except those that are consumers with ratings of less than 30 Amps.



Add Custom Query Window

- **Custom Query Name:** Name to distinguish query
- **Join Criteria Using:** Specifies if the list of criteria should be joined using AND or OR logic. If AND is chosen, ALL criteria in the list MUST be true for items to show. If OR is chosen, at least one must be true.

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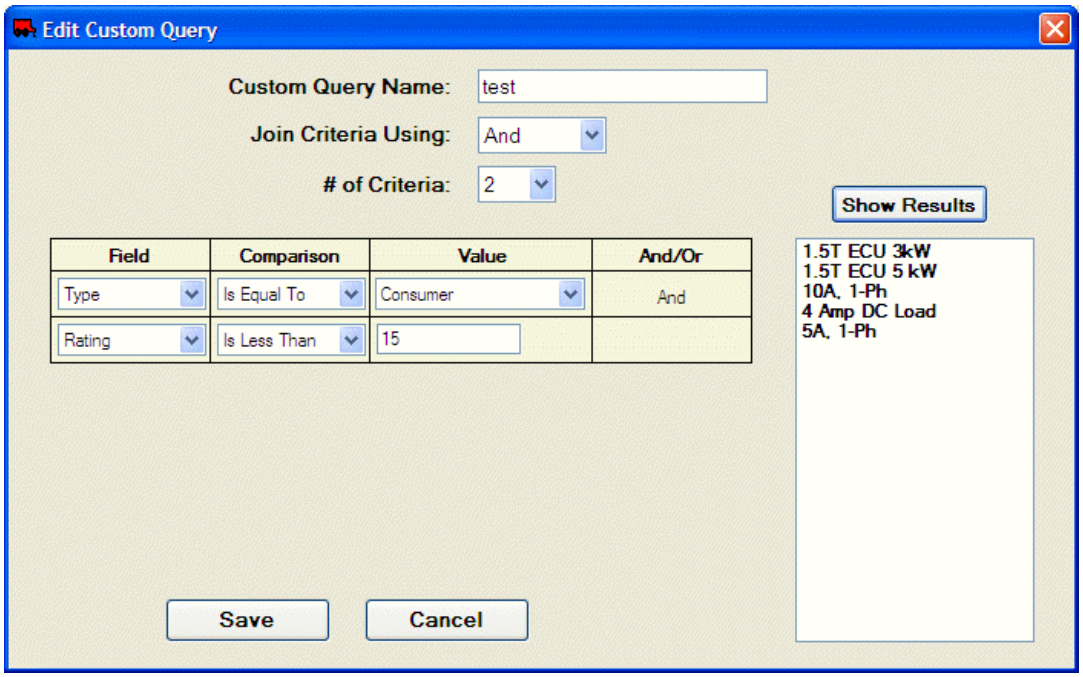
- **# of Criteria:** Specifies how many criteria desired.
- **Criteria Table:** For each criteria, specify the item field to evaluate, the comparison to be made and the value to compare by.
- **Show Results:** Click to show the results of applying the custom query to the Toolbox prior to saving

13.12.2 Edit Custom Query

See Add Items From Toolbox for how to open the **Edit Custom Query** window.

The **Edit Custom Query** window is used to edit a query in the Toolbox. A query is simply a set of commands which instruct AutoDISE how to filter the items in the Toolbox for ease in locating desired items.

The custom query shown below demonstrates the features of this window. This query filters out all items except those that are consumers with ratings of less than 15 Amps.



Edit Custom Query Window

- **Custom Query Name:** Name to distinguish query
- **Join Criteria Using:** Specifies if the list of criteria should be joined using AND or OR logic. If AND is chosen, ALL criteria in the list MUST be true for items to show. If OR is chosen, at least one must be true.
- **# of Criteria:** Specifies how many criteria desired.
- **Criteria Table:** For each criteria, specify the item field to evaluate, the comparison to be made and the value to compare by.
- **Show Results:** Click to show the results of applying the custom query to the Toolbox prior to saving

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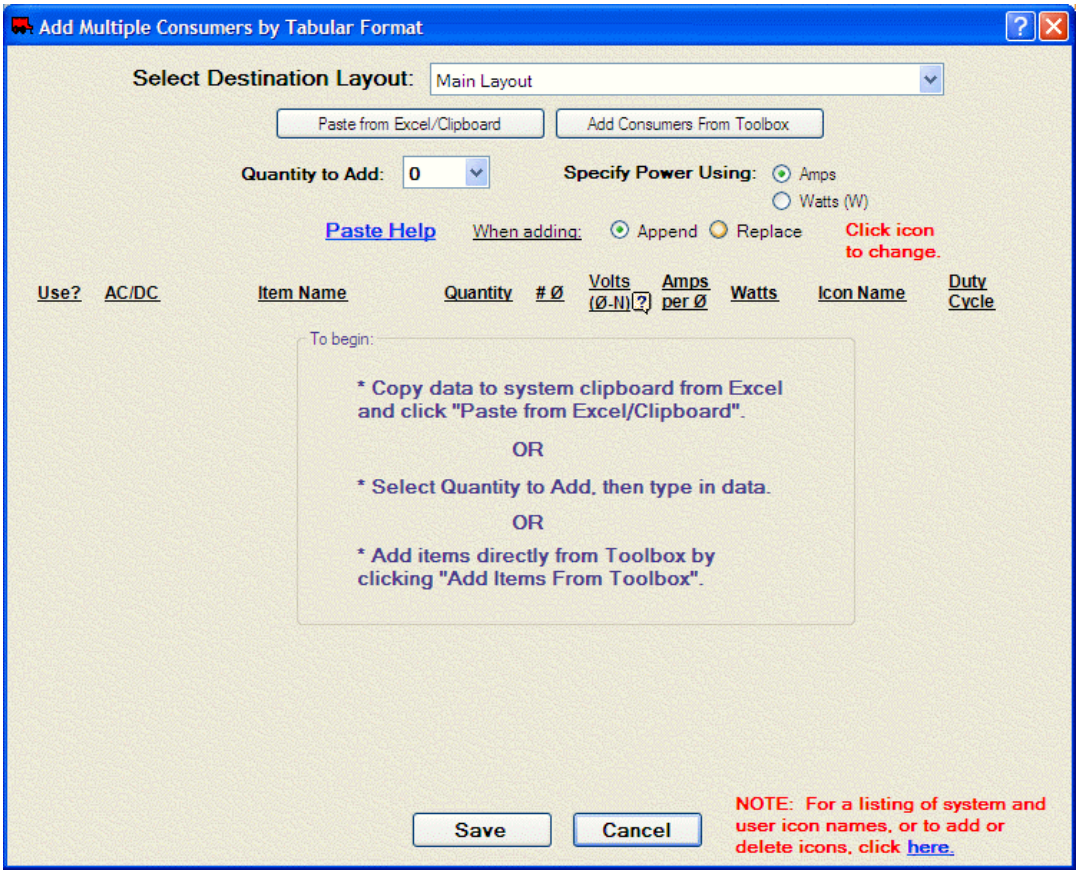
13.13 Add Multiple Consumers By Tabular Format

The **Add Multiple Consumers By Tabular Format** window is used to quickly and more efficiently add custom consumers to the main layout or a shelter layout.

The **Add Multiple Consumers By Tabular Format** window may be accessed by:

1. **Main Layout and Staking Layout**: Clicking the **Add Multiple Consumers By Tabular Format** button in the Main Toolbar, or selecting **Add Multiple Consumers By Tabular Format** from the Layout Menu.

2. **Shelter Layout**: Clicking the **Add Multiple Consumers By Tabular Format** button in the Shelter Window Toolbar



Add Multiple Consumers By Tabular Format Window

There are three methods by which to populate the list of consumers to be added:

1. Copy and paste from Microsoft Excel
2. Manually enter data
3. Add items directly from the Toolbox

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All three methods can be used in any order to add items to the table. When methods 1 or 3 are used, make sure you select the appropriate **Append** or **Replace** option to specify whether you want to add to or completely replace the data currently in the table.

Once the table is populated as desired, click the **Save** button to add the items to the layout. The items will be added to the top, left corner of the layout in an ordered fashion.

Note: When using any of these methods the user has the option of specifying consumer power using either Amps, or Watts (assuming power factor = 1). Select the desired method using the radio buttons near the top of the window. During a single use of this window, all consumers must use the same method. If you have some consumers which have power defined by Amps and others by Watts, you must open this window and submit information twice, once for each method.

Copy and paste from Microsoft Excel

Layout designers oftentimes have multiple consumer information in a formatted Microsoft Excel spreadsheet. To reduce the need to hand type all this data into the program, AutoDISE provides a method for moving data easily from Excel spreadsheets directly into a layout.

To accomplish this, first open up the Excel spreadsheet and highlight the range of cells in which the desired data resides. (Note the fields of interest as shown by the fields listed in the window.) The desired information now resides on the Microsoft Windows clipboard.

Now, click **Paste from Excel/Clipboard**. This opens the **Identify Excel Columns for Paste Action** window where the user can map the pasted column definitions to the fields of interest in the AutoDISE table. In the example below, the user copied from Excel a range of 9 rows and 5 cells. Note that the field names at the top do not correspond to the content of the columns, except for the last one ("Volts (-N)").

The user must now select the actual field name from each column drop down list. If a column contains data that does not correlate to the one of the field options, the user should select "Not Used" for that column. The user may also choose to not include specific rows by de-selecting the checkbox in the "Use?" column. When done, click the **Done** button.

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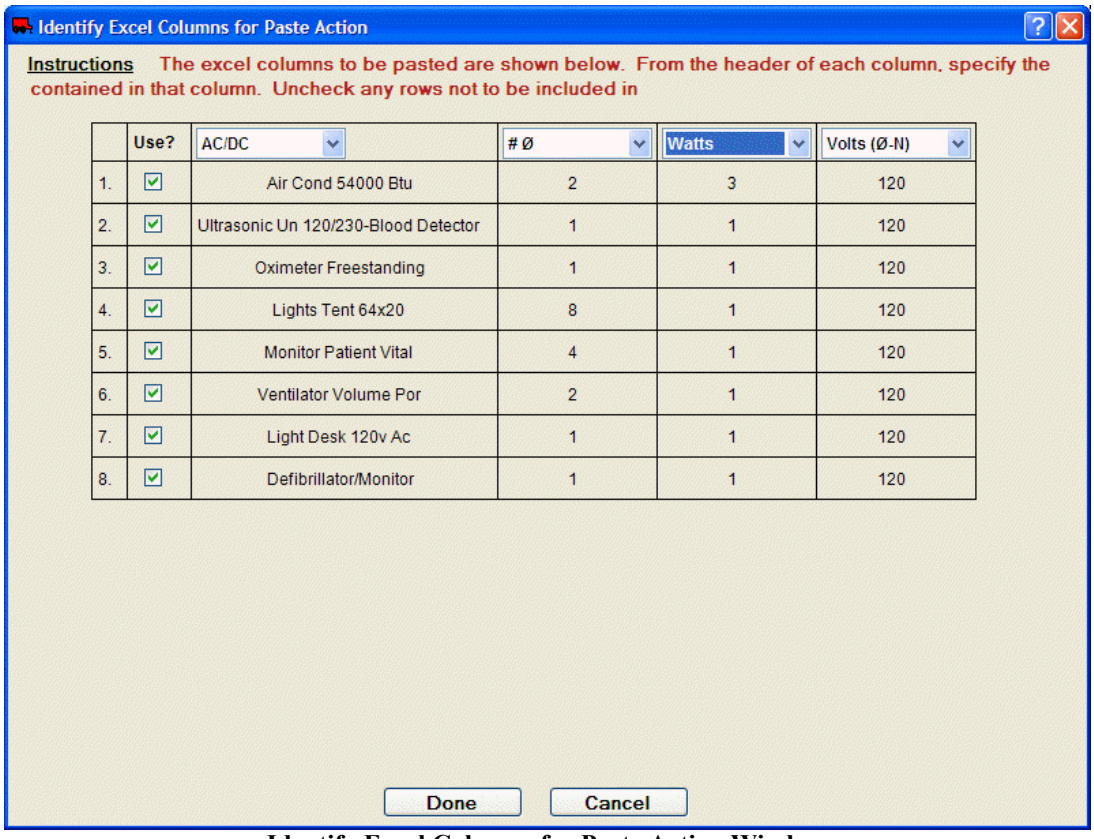
Identify Excel Columns for Paste Action
Instructions The excel columns to be pasted are shown below. From the header of each column, specify the contained in that column. Uncheck any rows not to be included in
Use?
AC/DC
Ø
Watts
Volts (Ø-N)
1. Air Cond 54000 Btu 2 3 120
2. Ultrasonic Un 120/230-Blood Detector 1 1 120
3. Oximeter Freestanding 1 1 120
4. Lights Tent 64x20 8 1 120
5. Monitor Patient Vital 4 1 120
6. Ventilator Volume Por 2 1 120
7. Light Desk 120v Ac 1 1 120
8. Defibrillator/Monitor 1 1 120
Done
Cancel

Identify Excel Columns for Paste Action Window

The result shows the original table now populated with the pasted data. Note in the example below that default values have been set for fields that were not included in the paste action. The user may now manually complete the table, including selection of icons for each row.

Note: Icon names may be specified in the actual Excel spreadsheet before copying the Excel data to the clipboard. To do this, the user must know the Icon Names of all icons that wish to be used. Icon names can be found by clicking on the note at the bottom right of the window. Icons available for this operation must be in the database. Custom icons may be added using the Icon Manager.

When done, click the **Save** button.

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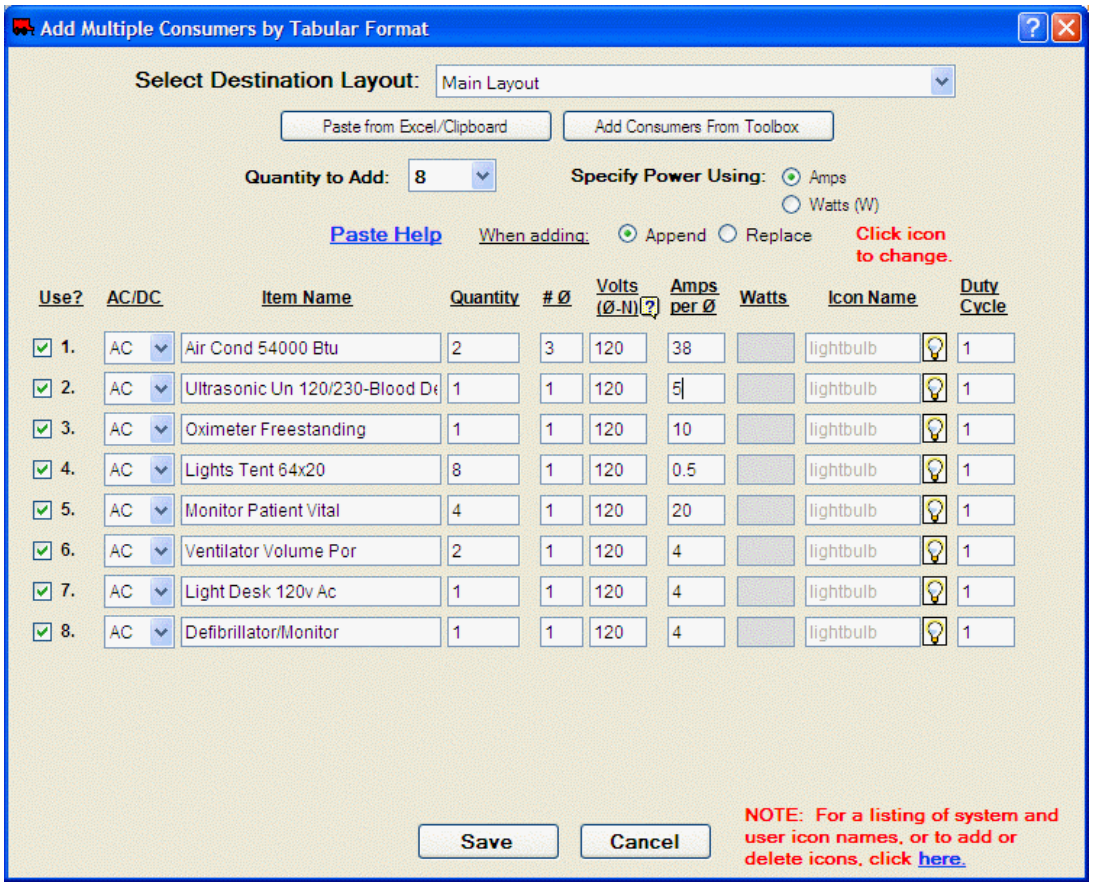
Add Multiple Consumers by Tabular Format
Select Destination Layout: Main Layout
Paste from Excel/Clipboard
Add Consumers From Toolbox
Quantity to Add: 8
Specify Power Using: Amps
Watts (W)
Paste Help
When adding: Append Replace
Click icon to change.
Use? AC/DC Item Name Quantity # Ø Volts (Ø-N) Amps per Ø Watts Icon Name Duty Cycle
1. AC Air Cond 54000 Btu 2 3 120 38 lightbulb 1
2. AC Ultrasonic Un 120/230-Blood D 1 1 120 5 lightbulb 1
3. AC Oximeter Freestanding 1 1 120 10 lightbulb 1
4. AC Lights Tent 64x20 8 1 120 0.5 lightbulb 1
5. AC Monitor Patient Vital 4 1 120 20 lightbulb 1
6. AC Ventilator Volume Por 2 1 120 4 lightbulb 1
7. AC Light Desk 120v Ac 1 1 120 4 lightbulb 1
8. AC Defibrillator/Monitor 1 1 120 4 lightbulb 1
Save
Cancel
NOTE: For a listing of system and user icon names, or to add or delete icons, click here.

Manually enter data

A user may manually enter information, or edit or add to information which was added using either of the other two methods. If more or less rows are needed, select the desired number of rows from the **Quantity to Add** drop down list. The, simply hand type in or select desired information. To change an icon, click on the current icon image and select a new one from the **Change Icon** window that appears.

When done, click the **Save** button.

Add Items Directly from the Toolbox

The user may add items directly from the Toolbox by clicking the **Add Consumers from Toolbox** button. This opens the **Add Consumers from Toolbox** window. In this window, double-click desired consumers in the list at the top-left of the window to add them to the **List of Selected Items** to the right. Selecting an item more than once will increment the quantity of that item in the list. Alternatively, the user may select an item from the list at the top-left, then click the **Select** button to add it to the **List of Selected Items.**

The **Item Name Search** and **Custom Query** features of this window are identical to those in the Add Items from Toolbox window.

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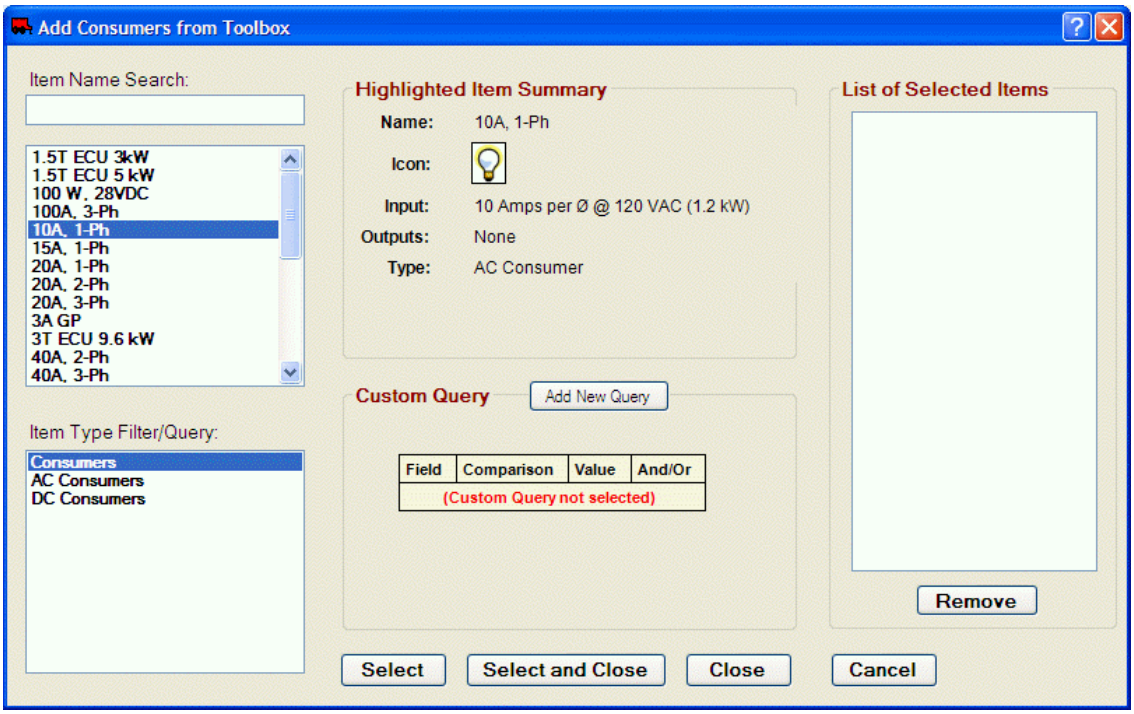
In the example below, the user selected the "10A, 1-Ph" consumer twice and the "1.5T ECU 3kW" consumer once. Clicking the **Close** button will populate the table on the **Add Multiple Consumers By Tabular Format** window with this information.



The information in the table may now be edited. When done, click the **Close** button. The selected items will now appear in the **Add Multiple Consumers By Tabular Format** window. The user may now manually complete the table, including selection of icons for each row.

When done, click the **Save** button.

13.14 Printing

13.14.1 Print Layout

To print a layout, open the **Print Layout** window by either clicking on the **Print Layout** button on the Main Toolbar, selecting **Print Layout...** from the File Menu, or selecting the **Print Layout** button on the Shelter Window Toolbar.

In all three cases, the same window appears, but with the **Print Layout** drop-down list initialized to different options. Those options include Main Layout, Staking Layout, and one option for each open shelter window.

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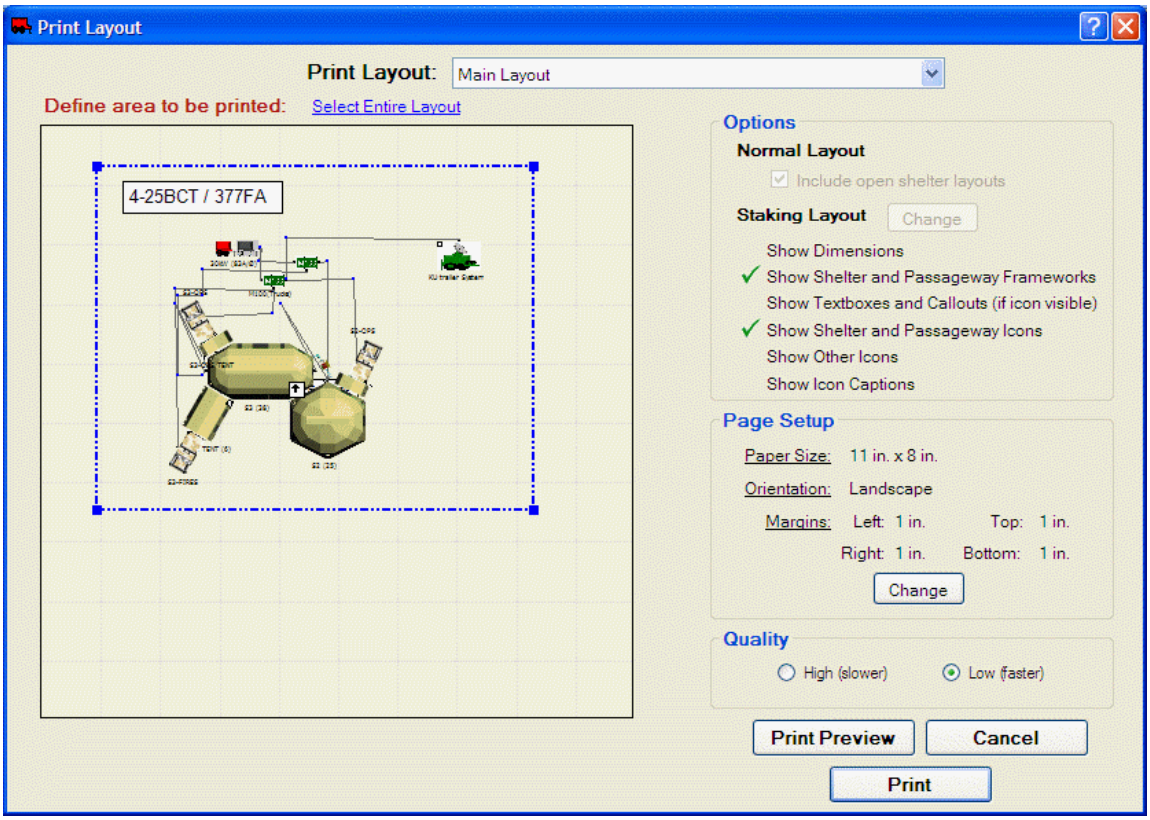

Print Layout Window

Main Layout

When the **Main Layout** option is selected, the user has the option of including open shelter layouts in the printed layout. If no shelter windows are open, this option will be disabled. To turn this feature on and off, check or uncheck the **Include open shelter layouts** checkbox, located in the **Options - Normal Layout** section of the window.

Staking Layout

When the **Staking Layout** option is selected, the user has the option of selecting from six staking view options:

- **Show Dimensions**: Shows all automated and custom staking dimensions.
- **Show Shelter and Passageway Frameworks**: Shows all shelter and passageway frameworks.
- **Show Textboxes and Item Callouts**: Shows all textboxes and item callouts for items whose icons are visible in the staking layout.
- **Show Shelter and Passageway Icons**: Shows all shelter and passageway icons
- **Show Other Icons**: Shows all non-shelter and non-passageway icons
- **Show Icon Captions**: Shows all icon captions

When the **Print Layout** window is first opened, these options are initialized to the values set

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in the Staking View Options window of the Staking View. ***Changes to the options inside the Print Layout window only impact what is printed and do NOT affect the options in the Staking View Options window of the Staking View.***

To edit the staking view options for the **Print Layout** window, click on the **Change** button in the **Options - Staking Layout** section of the window. This opens the **Staking Print Options** window, identical to the Staking View Options window. Make desired changes and click **Save**.

Print Options

The area to be printed can be modified by clicking and dragging the corners of the blue dotted rectangle in the image. In addition, the entire box may be shifted in any direction by clicking and dragging an edge of this rectangle. The user may also click the **Select Entire Layout** link to select the entire area.

The **Page Setup** for printing defaults to a specified paper size, orientation and margins. To adjust these settings, click the **Change** button in the **Page Setup** section and select new values.

Print quality can be set in the **Quality** section. Low quality is faster but can produce pixelated results in some circumstances. High quality can be much slower, especially for large layouts, but produces crisp, presentation quality results.

To preview the print prior to printing, click the **Preview** button. To print, click the **Print** button.

13.14.2 Print Inventory

To print an inventory, open the **Print Inventory** window by either selecting **Print Inventory...** from the File Menu, or by opening an Inventory View and clicking on the **Print** link next to the **Edit Filter** button.

In each case, the same window appears, but with different items in the inventory list selected for printing.

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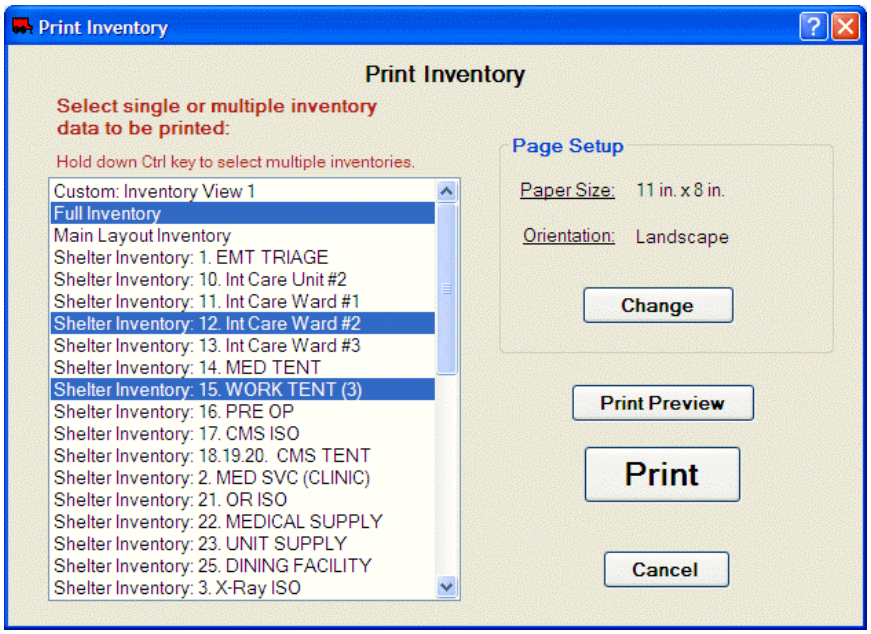
Print Inventory
Print Inventory
Select single or multiple inventory data to be printed:
Hold down Ctrl key to select multiple inventories.
Custom: Inventory View 1
Full Inventory
Main Layout Inventory
Shelter Inventory: 1. EMT TRIAGE
Shelter Inventory: 10. Int Care Unit #2
Shelter Inventory: 11. Int Care Ward #1
Shelter Inventory: 12. Int Care Ward #2
Shelter Inventory: 13. Int Care Ward #3
Shelter Inventory: 14. MED TENT
Shelter Inventory: 15. WORK TENT (3)
Shelter Inventory: 16. PRE OP
Shelter Inventory: 17. CMS ISO
Shelter Inventory: 18.19.20. CMS TENT
Shelter Inventory: 2. MED SVC (CLINIC)
Shelter Inventory: 21. OR ISO
Shelter Inventory: 22. MEDICAL SUPPLY
Shelter Inventory: 23. UNIT SUPPLY
Shelter Inventory: 25. DINING FACILITY
Shelter Inventory: 3. X-Ray ISO
Page Setup
Paper Size: 11 in. x 8 in.
Orientation: Landscape
Change
Print Preview
Print
Cancel

Print Inventory Window

The inventory list contains a collection of inventory collections to print:

- **Full Inventory** - prints an inventory of all items in the main layout AND all shelter layouts.
- **Main Layout** - prints an inventory of all items in the main layout ONLY
- **Shelter Inventory** - prints an inventory of all items in the specified shelter ONLY
- **Custom Inventory** - prints a custom inventory defined in the Inventory View tab.

For the first three options, the fields shown in the printed table are the "**default**" fields defined in Filtering an Inventory View.

Any combination of these inventory options may be combined and printed together by selecting multiple items in the list. Do this by holding down the **Ctrl key** while clicking on items in the list.

The **Page Setup** for printing defaults to a specified paper size and orientation. To adjust these settings, click the **Change** button in the **Page Setup** section and select new values.

To preview the print prior to printing, click the **Preview** button. To print, click the **Print** button.

13.14.3 Print Analysis

To print an analysis, open the **Print Analysis** window by either selecting **Print Analysis...** from the File Menu, or by opening an Analysis View and clicking on the **Print** link next to the **Edit Filter** button.

In each case, the same window appears, but with different items in the analysis list selected

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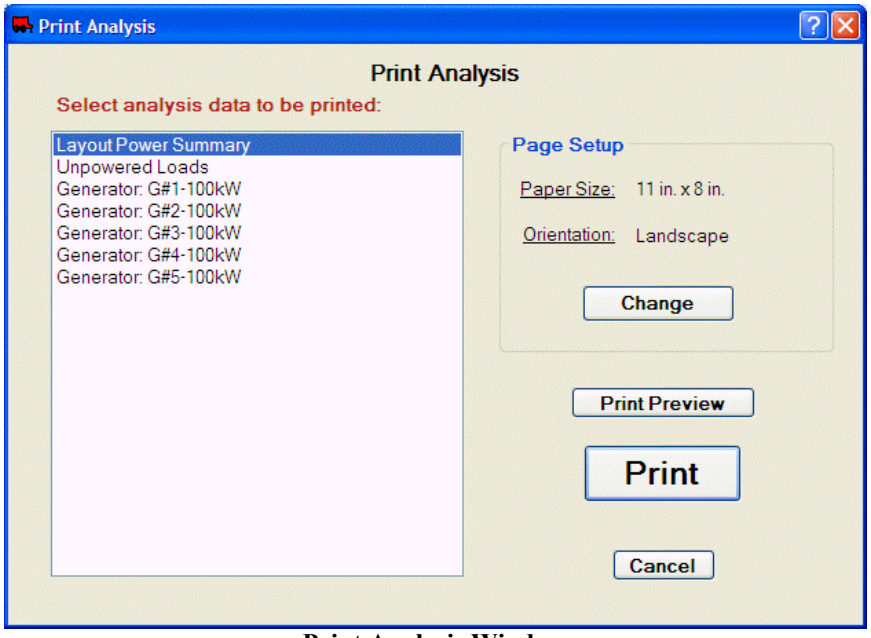
for printing.



Print Analysis Window

The analysis list contains a collection of analyses to print:

- **Layout Power Summary** - prints the Layout Power Summary
- **Unconnected Loads** - prints the Unpowered Loads view
- **Generator** - prints the Generator Load Summary for the specified generator

The **Page Setup** for printing defaults to a specified paper size and orientation. To adjust these settings, click the **Change** button in the **Page Setup** section and select new values.

To preview the print prior to printing, click the **Preview** button. To print, click the **Print** button.

13.15 Exporting

13.15.1 Export Layout to Image

To export a layout to an image, open the **Export Layout to Image** window by either clicking on the **Export Layout to Image** button on the Main Toolbar, selecting **Export Layout to Image...** from the File Menu, or selecting the **Export Layout to Image** button on the Shelter Window Toolbar.

In all three cases, the same window appears, but with the **Export Layout to Image** drop-down list initialized to different options. Those options include Main Layout, Staking Layout, and one option for each open shelter window.

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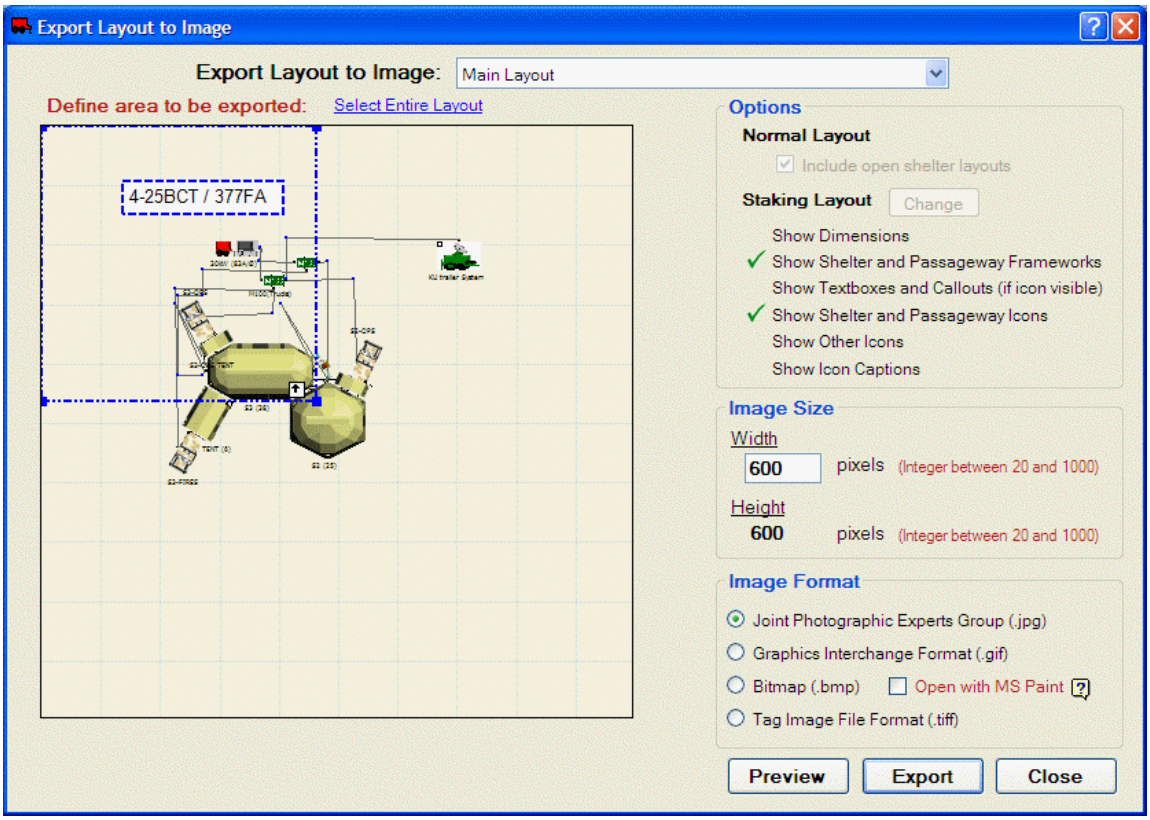

Export Layout Window

Main Layout

When the **Main Layout** option is selected, the user has the option of including open shelter layouts in the exported layout. To turn this feature on and off, check or uncheck the **Include open shelter layouts** checkbox.

Staking Layout

When the **Staking Layout** option is selected, the user has the option of selecting from six staking view options:

- **Show Dimensions**: Shows all automated and custom staking dimensions.
- **Show Shelter and Passageway Frameworks**: Shows all shelter and passageway frameworks.
- **Show Textboxes and Item Callouts**: Shows all textboxes and item callouts for items whose icons are visible in the staking layout.
- **Show Shelter and Passageway Icons**: Shows all shelter and passageway icons
- **Show Other Icons**: Shows all non-shelter and non-passageway icons
- **Show Icon Captions**: Shows all icon captions

When the **Export Layout to Image** window is first opened, these options are initialized to the values set in the Staking View Options window of the Staking View. ***Changes to the***

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options inside the Export Layout to Image window only impact what is exported and do NOT affect the options in the Staking View Options window of the Staking View.

To edit the staking view options for the **Export Layout to Image** window, click on the **Change** button in the **Options - Staking Layout** section of the window. This opens the **Staking Export Options** window, identical to the Staking View Options window. Make desired changes and click **Save**.

Export Options

The area to be exported can be modified by clicking and dragging the corners of the blue dotted rectangle in the image. In addition, the entire box may be shifted in any direction by clicking and dragging an edge of this rectangle. The user may also click the **Select Entire Layout** link to select the entire area.

The **Image Size** specifies the size of the exported image. Modify values as desired.

Select from one of four export image formats: .jpg, .gif, .bmp and .tiff.

> ***Note**: .bmp images exported from AutoDISE may not open properly in some paint programs, including certain version of Adobe Photoshop. Since AutoDISE will open the exported image in the program registered as the default program for the desired image type, the user may want to force .bmp files to open in Microsoft Paint. If this is the case, simply check the Open with MS Paint checkbox next to the .bmp checkbox.*

To preview the export prior to exporting, click the **Preview** button. To export, click the **Export** button.

13.15.2 Export Inventory

To export an inventory, open the **Export Inventory** window by either selecting **Export Inventory...** from the File Menu, or by opening an Inventory View and clicking on the **Export** link next to the **Edit Filter** button.

In each case, the same window appears, but with different items in the inventory list selected for exporting.

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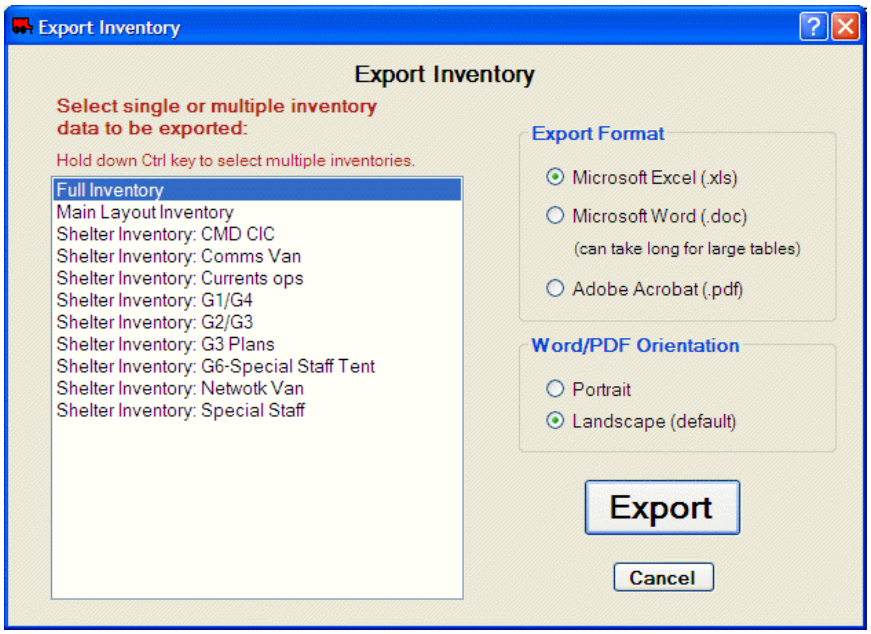

Export Inventory Window

The inventory list contains a collection of inventory collections to export:

- **Full Inventory** - exports an inventory of all items in the main layout AND all shelter layouts.
- **Main Layout** - exports an inventory of all items in the main layout ONLY
- **Shelter Inventory** - exports an inventory of all items in the specified shelter ONLY
- **Custom Inventory** - exports a custom inventory defined in the Inventory View tab.

For the first three options, the fields shown in the exported table are the "**default**" fields defined in Filtering an Inventory View.

Any combination of these inventory options may be combined and exported together by selecting multiple items in the list. Do this by holding down the **Ctrl key** while clicking on items in the list.

The **Export Format** section specifies the file type to export to. There are three options: Microsoft Excel (.xls), Microsoft Word (.doc) and Adobe Acrobat (.pdf).

> ***Note:*** ***Microsoft Word exports can take a significant length of time to export if the inventory tables are large.***

The **Word/PDF Orientation** section allows the user to switch between portrait or landscape page orientations for Word or PDF export formats.

To export, click the **Export** button.

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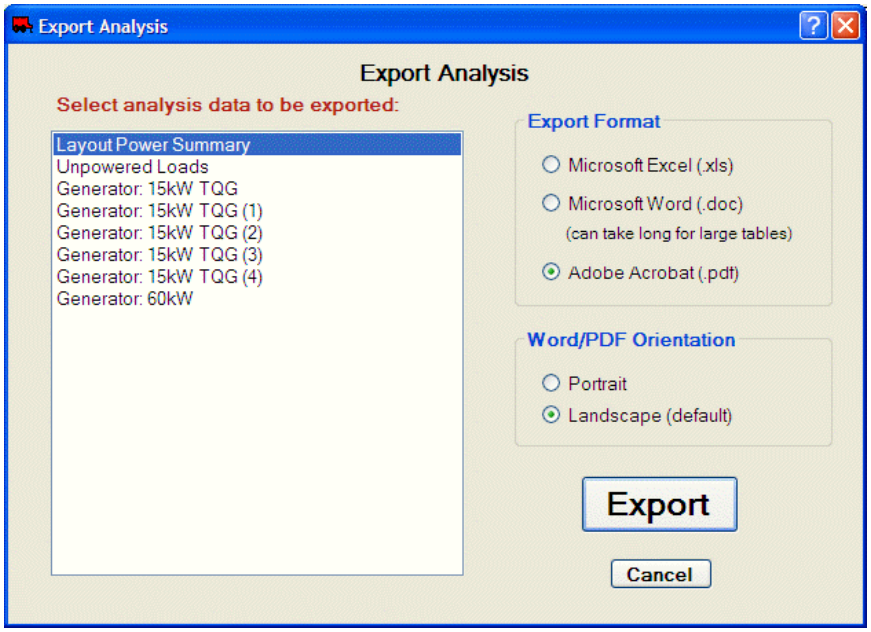
13.15.3 Export Analysis

To export an analysis, open the **Export Analysis** window by either selecting **Export Analysis...** from the File Menu, or by opening an Analysis View and clicking on the **Export** link next to the **Edit Filter** button.

In each case, the same window appears, but with different items in the analysis list selected for exporting.



Export Analysis Window

The analysis list contains a collection of analyses to export:

- **Layout Power Summary** - exports the Layout Power Summary
- **Unconnected Loads** - exports the Unpowered Loads view
- **Generator** - exports the Generator Load Summary for the specified generator

The **Export Format** section specifies the file type to export to. There are three options: Microsoft Excel (.xls), Microsoft Word (.doc) and Adobe Acrobat (.pdf).

> ***Note:** Microsoft Word exports can take a significant length of time to export if the analysis tables are large.*

The **Word/PDF Orientation** section allows the user to switch between portrait or landscape page orientations for Word or PDF export formats.

To export, click the **Export** button.

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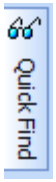
13.16 Quick Find Window

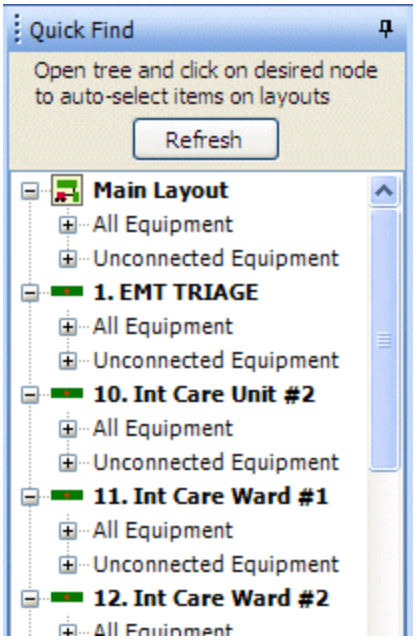
The **Quick Find Window** is used to quickly locate one or more items on a layout.

To open the **Quick Find Window**, click on the Quick Find icon on the left of the screen.



The Quick Find Icon

The **Quick Find Window** will pop out to reveal a tree structure:



Quick Find Window

The tree structure in this window behaves just like the tree structure in Windows Explorer. Click the "+" to expand a node and the "-" to collapse a node.

The window initializes with a "root" node for the main layout and one root node for each shelter in the main layout. Each root node contains two "child" nodes:

- **All Equipment** - Contains a list of all equipment on the "parent" node's layout
- **Unconnected Equipment** - Contains a list of all UNCONNECTED equipment on the "parent" node's layout

The figure below shows the expanded **All Equipment** node for the first shelter:

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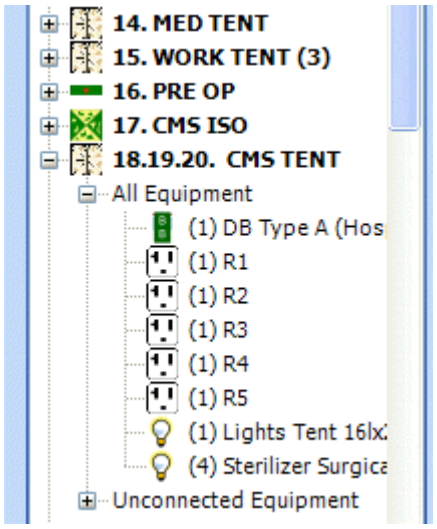

Note that each item has a number in parentheses before it...this specifies the quantity of that item. To be combined in one node, items must have matching names and types.

To locate an item, click on the node for that item and the item(s) for that node will be highlighted on the main or shelter layout, wherever they are located.

13.17 Icon Manager

The **Icon Manager** is a utility for adding and removing custom user-defined icons from the Toolbox. It also provides the names of each icon to be used when adding multiple consumers to a layout using the Add Multiple Consumers By Tabular Format window.

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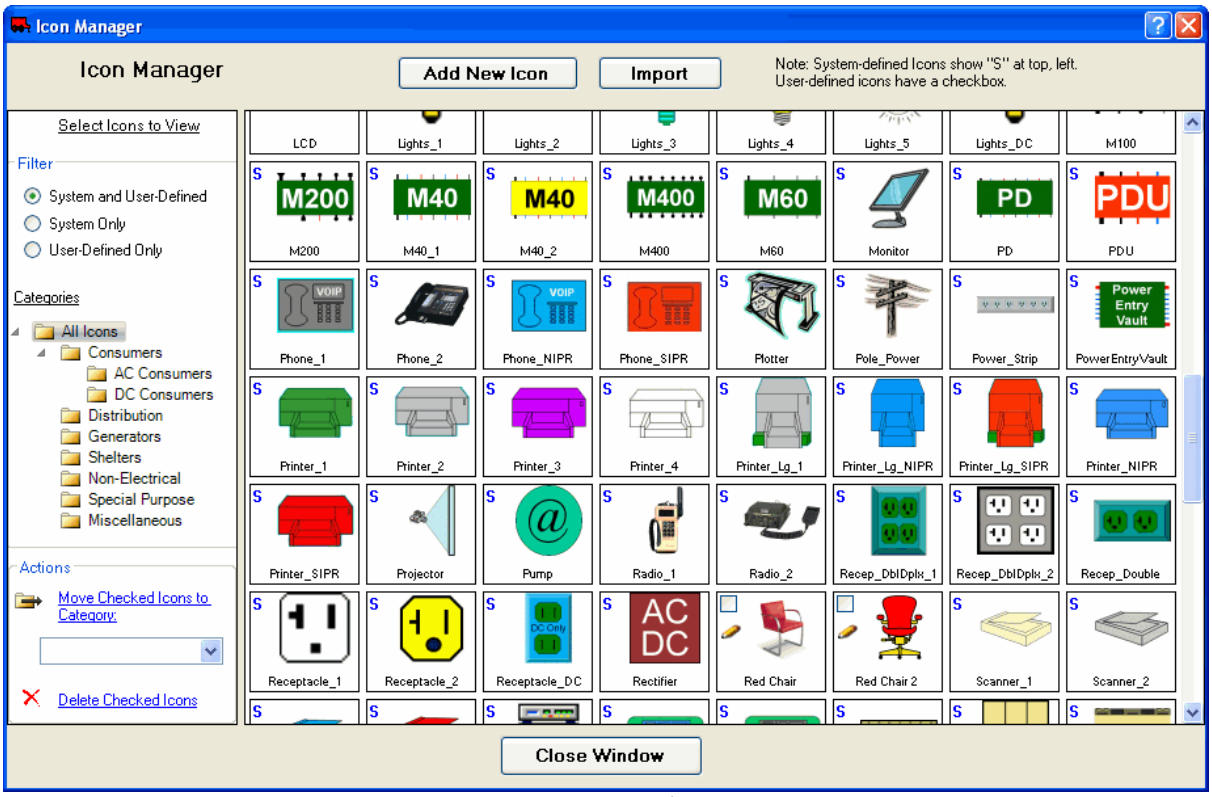

Icon Manager Window

The window displays **System Defined Icons**, which may not be edited or removed, as well as all **User Defined Icons** which have been added by any user on the client machine. By default, the Icon Manager filters on User-Defined Only. This filter option may be changed in the **Filter** section at the top left of the window.

Categories

The **Icon Manager** organizes all icons in Categories which closely mimic the item types found in the AutoDISE Toolbox. Available categories are Consumers (further sub-categorized in AC Consumers and DC Consumers), Distribution, Generators, Shelters, Non-Electrical, Special Purpose and Miscellaneous. The Categories tree in the **Filter** section allows the user to filter against each of these categories. Click a folder on the tree to activate a category filter.

Adding New Icons

To add a new user-defined icon, click **Add New Icon** to open the Add New Icon window.

Importing

The user may also add new icons to the Toolbox by importing them from the Toolbox of another computer or from an AutoDISE layout (.adf) file. To do this, click the **Import** button. See Import Icons.

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Editing User Defined Icons

To edit an existing user-defined icon, click the **Edit** button next to the user-defined icon you wish to edit. This will open the Edit Icon window.

Actions

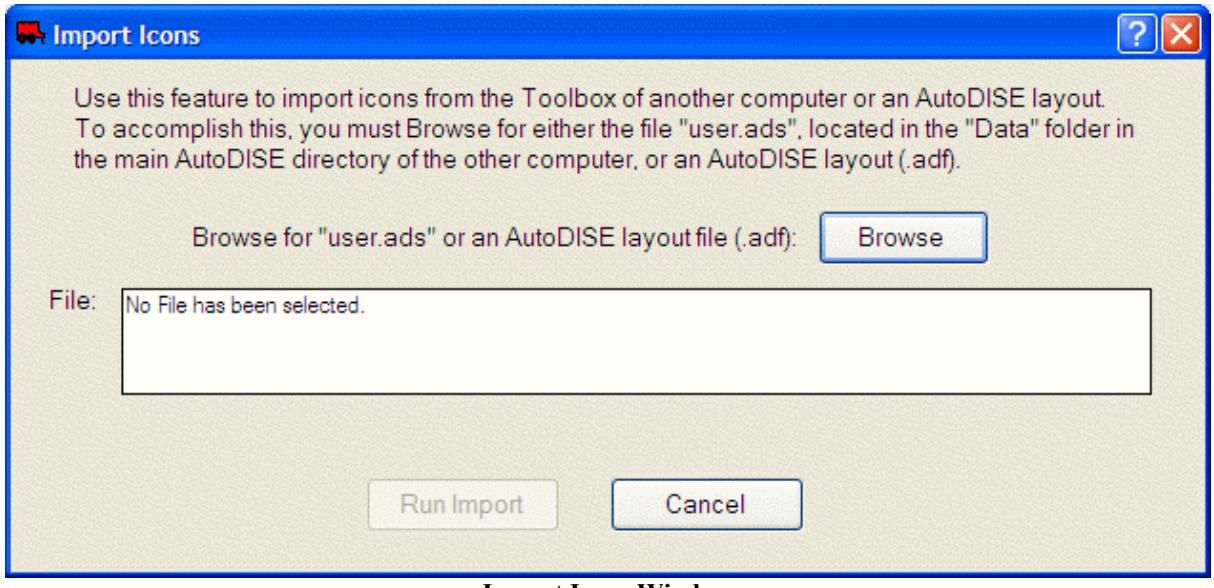
The Icon Manager provides two tools for acting on multiple user-defined icons at the same time, located at the bottom left of the window. For each tool, the user must first check the checkbox next to at least one user-defined icon. The action is then carried out on all checked icons.

- **Move Checked Icons to Category**: Select a category from the drop down list. Check desired icons and click the link to move all checked icons to the selected category.
- **Delete Checked Icons**: Check desired icons and click link to delete all checked icons.

13.17.1 Import Icons

Toolbox icons may be imported from another computer or from an AutoDISE layout (.adf).

To open the **Import Icons** window, open the Icon Manager and click on the **Import** button


Import Icons
Use this feature to import icons from the Toolbox of another computer or an AutoDISE layout.
To accomplish this, you must Browse for either the file "user.ads", located in the "Data" folder in the main AutoDISE directory of the other computer, or an AutoDISE layout (.adf).
Browse for "user.ads" or an AutoDISE layout file (.adf):
Browse
File:
No File has been selected.
Run Import
Cancel

Import Icons Window

To use this window, first browse for either:

1. The file named "**user.ads**", located in the "Data" folder in the main AutoDISE directory of the another computer running AutoDISE; OR
2. An AutoDISE layout (.adf) file

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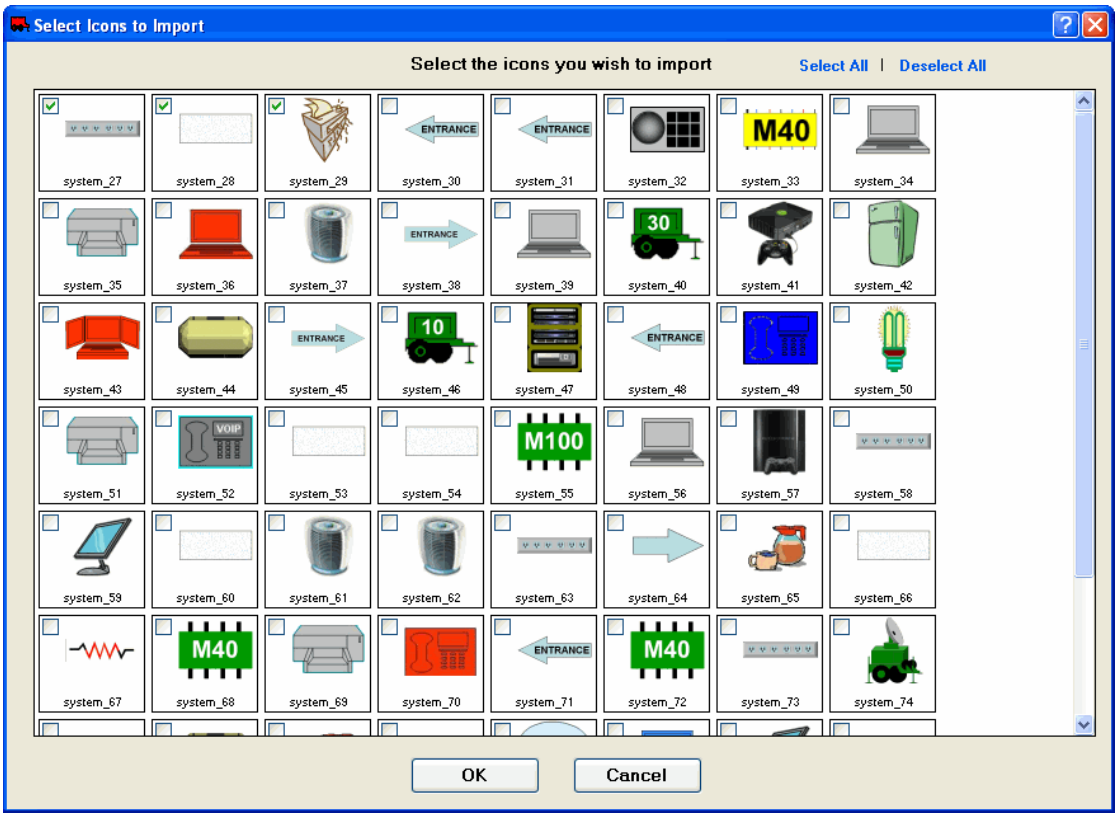
Once a valid file is found, its file path will show in the **File** textbox and the **Run Import** button will be enabled. Click the **Run Import** button to begin the import process.

This opens the **Select Icons to Import** window, where the user can view and select which icons from the specified file they wish to actually transfer. In this window, check the icons desired.



When done, click **OK** to complete the import process.

13.18 Icon Framework Manager

The **Icon Framework Manager** provides functionality for adding, editing and removing Icon Frameworks from the AutoDISE toolbox.

To open the **Icon Framework Manager**, select **Icon Framework Manager** from the **Staking** menu on the Main Menu.

The **Icon Framework Manager** window is shown below:

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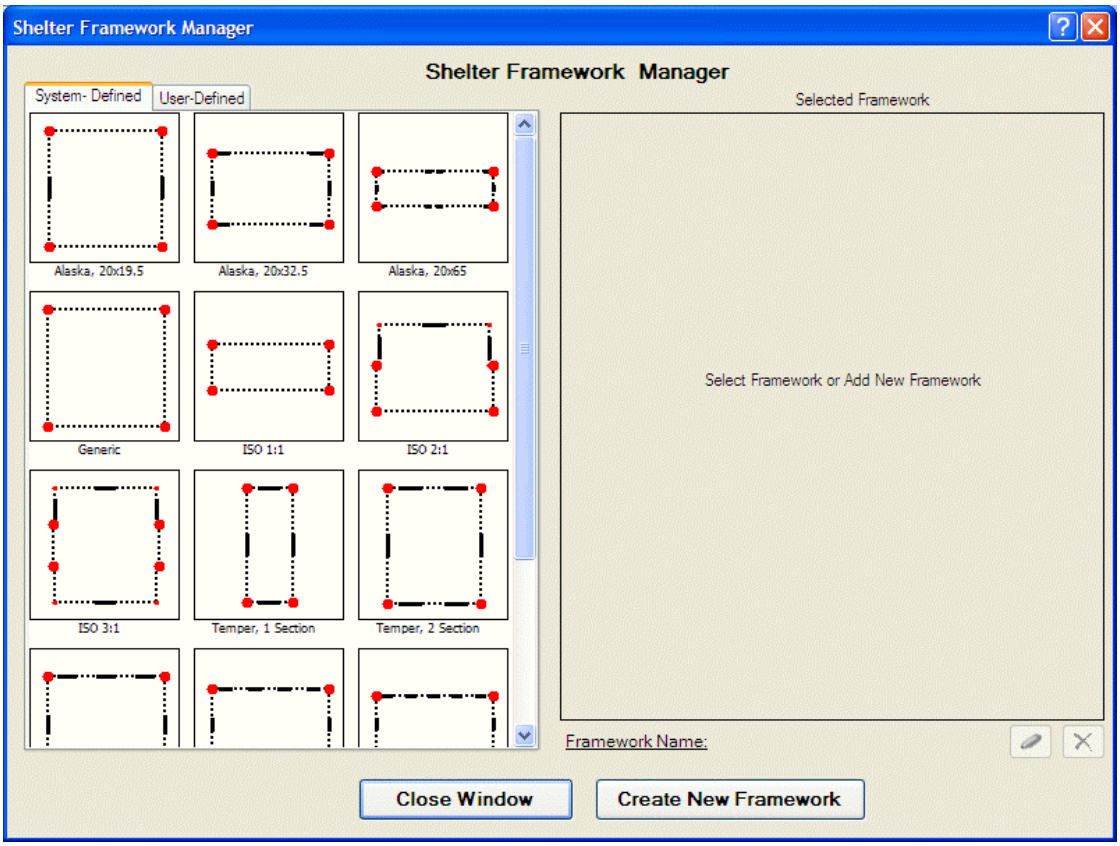

Icon Framework Manager Window

The window groups frameworks into two categories: **System-Defined** and **User-Defined.** Only user-defined frameworks may be edited and/or deleted.

Adding a New Framework

To add a new user-defined framework, click on the **Create New Framework** button at the bottom of the window. This opens the **Create New Icon Framework** window. See Create New Icon Framework window for more information.

Edit an Existing User-Defined Framework

To edit an existing user-defined framework, click the **User-Defined** tab to view all user-defined frameworks. Click on the desired framework and the framework detail and name appear on the right side of the window. Finally, click the **Edit Framework** button at the lower right of the window to open the **Edit Icon Framework** window. See Edit Icon Framework window for more information.

Note: ***Frameworks assigned to existing shelters on a layout are copies of the original Toolbox frameworks. Therefore, any changes to Toolbox frameworks using the Icon Framework Manager window will NOT affect frameworks assigned to shelters. To edit a framework assigned to a specific shelter, see Editing an Icon Framework.***

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Delete an Existing User-Defined Framework

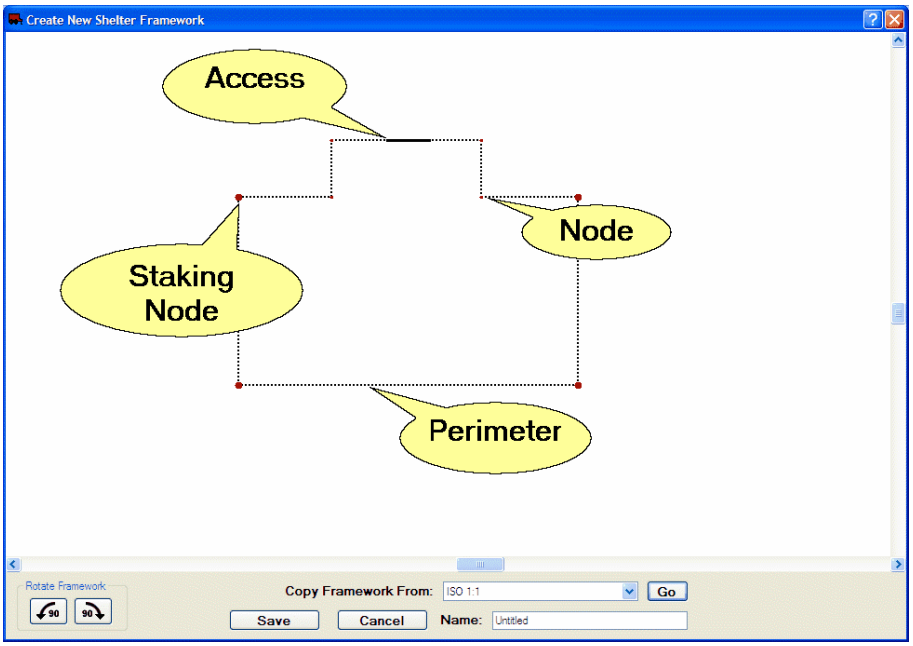
To delete an existing user-defined framework, click the **User-Defined** tab to view all user-defined frameworks. Click on the desired framework and the framework detail and name appear on the right side of the window. Finally, click the **Delete Framework** button at the lower right of the window. Following a dialog confirmation, the framework will be deleted from the Toolbox.

Note: ***Frameworks assigned to existing shelters on a layout are copies of the original Toolbox frameworks. Therefore, any deletion of Toolbox frameworks using the Icon Framework Manager window will NOT delete frameworks assigned to shelters.***

13.18.1 Create New Icon Framework

The **Create New Icon Framework** window allows a user to add user-defined frameworks to the Toolbox.

The window is shown below.



Create New Icon Framework Window

The Icon Framework is visible in the main viewing area. The image above highlights the primary components that are editable in this window:

- **Perimeter**: A dotted line defines the exterior perimeter of the framework.
- **Node**: A node is simply a location where the perimeter makes a 90 degree turn.
- **Staking Node**: A staking node is a node that will appear on the staking layout.

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Note: In the current version of AutoDISE, there must be exactly four staking nodes which form a perfect rectangle.

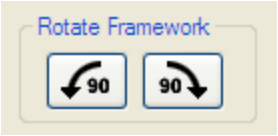
- **Access**: Shelter accesses are shown by a solid line. Shelter accesses define locations where passageways may connect to a shelter via the framework and are defined by their location, width and type. See Shelter Accesses for more detailed information.

Modifying the Icon Framework

Using the Icon Framework editing features to modify a Icon Framework consists of moving perimeter walls, adding/removing nodes, setting/unsetting staking nodes, and adding/removing/editing accesses. For a complete description on how to edit a framework in this window, see Using the Icon Framework Editor Features.

Rotating the Icon Framework

If the default orientation of the framework is not as desired, the framework can be rotated about itself using the framework rotation buttons in the bottom left of the window:



Framework Rotation Buttons

Copying from an Existing Framework

To save time it may be useful for a user to begin with an existing framework and go from there. To do this, select the desired starting framework from the **Copy Framework From** dropdown list and click the **Go** button.

Note: Using this feature erases ALL framework features that exist and replaces them with a copy of the selected framework. If any unsaved work was done on the erased framework prior to clicking the Go button, then that work will be lost.

Final Steps

Enter the desired name of the new framework and click the **Save** button. Click the **Cancel** button to exit the window without saving.

13.18.2 Edit Icon Framework

The **Edit Icon Framework** window allows a user to modify existing user-defined frameworks.

The window is shown below.

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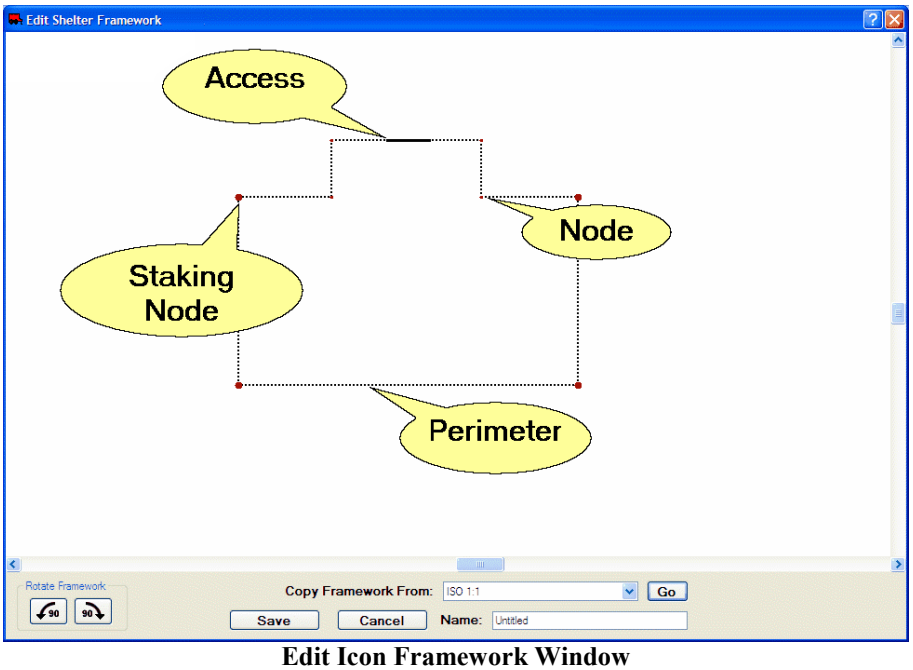

Edit Icon Framework Window

The Icon Framework is visible in the main viewing area. The image above highlights the primary components that are editable in this window:

- **Perimeter**: A dotted line defines the exterior perimeter of the framework.
- **Node**: A node is simply a location where the perimeter makes a 90 degree turn.
- **Staking Node**: A staking node is a node that will appear on the staking layout.

Note: In the current version of AutoDISE, there must be exactly four staking nodes which form a perfect rectangle.

- **Access**: Shelter accesses are shown by a solid line. Shelter accesses define locations where passageways may connect to a shelter via the framework and are defined by their location, width and type. See Shelter Accesses for more detailed information.

Modifying the Icon Framework

Using the Icon Framework editing features to modify a Icon Framework consists of moving perimeter walls, adding/removing nodes, setting/unsetting staking nodes, and adding/removing/editing accesses. For a complete description on how to edit a framework in this window, see Using the Icon Framework Editor Features.

Rotating the Icon Framework

If the default orientation of the framework is not as desired, the framework can be rotated about itself using the framework rotation buttons in the bottom left of the window:

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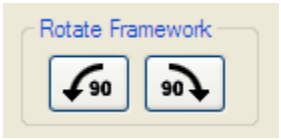

Framework Rotation Buttons

Copying from an Existing Framework

To save time it may be useful for a user to begin with an existing framework and go from there. To do this, select the desired starting framework from the **Copy Framework From** dropdown list and click the **Go** button.

Note: Using this feature erases ALL framework features that exist and replaces them with a copy of the selected framework. If any unsaved work was done on the erased framework prior to clicking the Go button, then that work will be lost.

Final Steps

Enter the desired name of the new framework and click the **Save** button. Click the **Cancel** button to exit the window without saving.

13.19 Select Link Connections

The **Select Link Connections** window is used to specify the connection parameters when creating a link using manual connect.

To manually connect two items, click on the Link Mode button L located on the Main Toolbar. You are now in link mode and your mouse icon will appear as an "L". Click on the first item to connect and drag to the second item to connect, then release the mouse. The **Select Link Connections** window appears in most situations.

Note: there are situations where AutoDISE will automatically make the connection. This happens when no additional information is required. Examples include:

- ***When chaining two single phase AC consumers***
- ***When connecting a DC consumer to a DC Rectifier or generator in DC mode.***
- ***When connecting a single phase AC consumer to a receptacle***

In this window, the user simply selects the two connections they wish to use to make the link. However, with some items there are unique options to select. The images below show the portion of the window containing the following item types:

- Generators
- DISE, Breaker Boxes, 2 and 3 Phase Consumers and Wye/FWH Adapters
- Single Phase Consumers
- DC Consumers
- Receptacle-to-Receptacle

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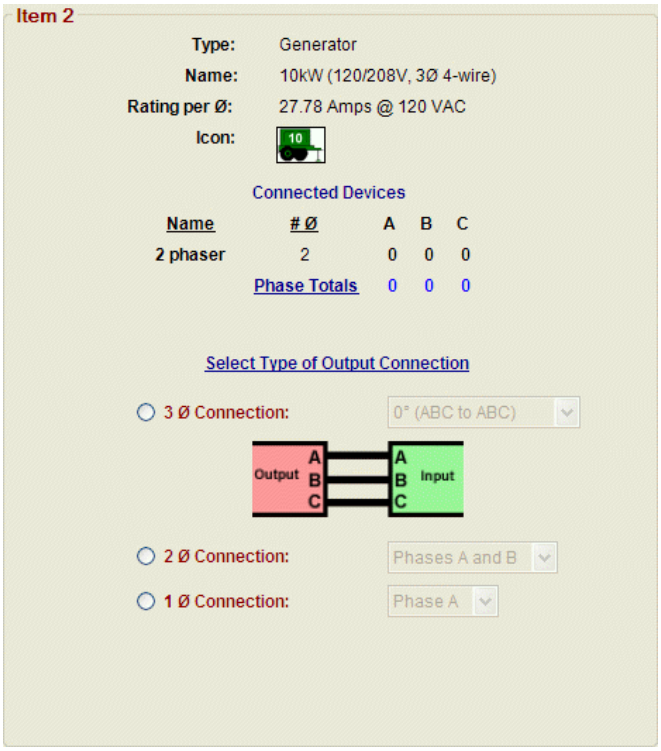
- Universal Adapters
- Transformers
- DC Rectifiers
- Inverters

For all types, this display provides some item detail to inform the user of what item they are attempting to connect. These may include the item type, the name of the item, the rating per phase, in Amps, and the icon of the item.

Generators


Item 2
Type: Generator
Name: 10kW (120/208V, 3Ø 4-wire)
Rating per Ø: 27.78 Amps @ 120 VAC
Icon:
Connected Devices
Name # Ø A B C
2 phaser 2 0 0 0
Phase Totals 0 0 0
Select Type of Output Connection
3 Ø Connection: 0° (ABC to ABC)
Output A B C
A B C Input
2 Ø Connection: Phases A and B
1 Ø Connection: Phase A

Select Link Connections - Generator Display

The generator display for the **Select Link Connections** window is unique in that, instead of selecting a particular connection to use, the user selects the "type" of connection to create.

Specifically, the user must select either a 1, 2 or 3 phase connection. In the case of a three phase connection, the user must also decide if any phase rotation will be accomplished via this connection, with the options to rotate phases by 0, 120 or 240 degrees. When selecting one or two phases for the connection, the user must select the precise phases they wish to connect to.

The generator display also shows all items currently attached to the generator, with information about the name of each item, the number of phases of the item and the generator phase load due to the item.

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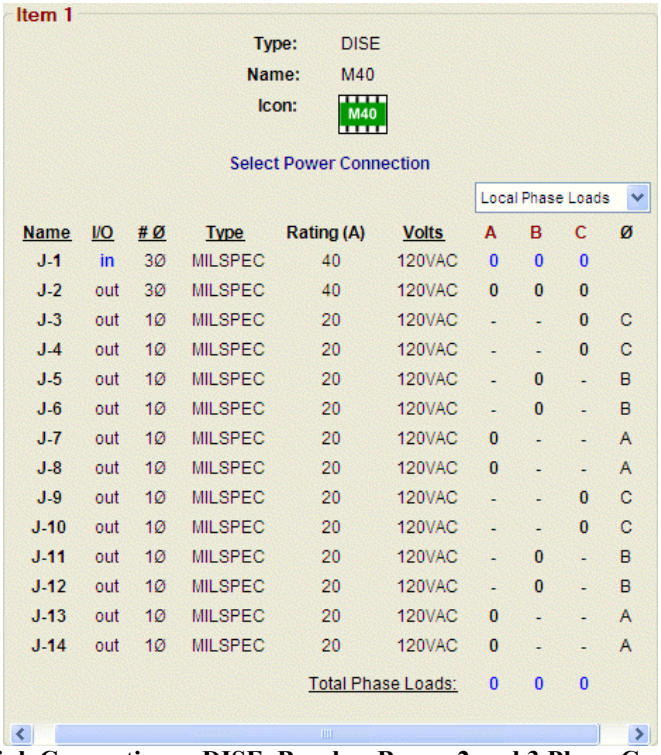
DISE, Breaker Boxes, 2 and 3 Phase Consumers and Wye/FWH Adapters



Item 1

Type: DISE
Name: M40
Icon: M40

Select Power Connection

Local Phase Loads

Name	I/O	# Ø	Type	Rating (A)	Volts	A	B	C	Ø
J-1	in	3Ø	MILSPEC	40	120VAC	0	0	0	
J-2	out	3Ø	MILSPEC	40	120VAC	0	0	0	
J-3	out	1Ø	MILSPEC	20	120VAC	-	-	0	C
J-4	out	1Ø	MILSPEC	20	120VAC	-	-	0	C
J-5	out	1Ø	MILSPEC	20	120VAC	-	0	-	B
J-6	out	1Ø	MILSPEC	20	120VAC	-	0	-	B
J-7	out	1Ø	MILSPEC	20	120VAC	0	-	-	A
J-8	out	1Ø	MILSPEC	20	120VAC	0	-	-	A
J-9	out	1Ø	MILSPEC	20	120VAC	-	-	0	C
J-10	out	1Ø	MILSPEC	20	120VAC	-	-	0	C
J-11	out	1Ø	MILSPEC	20	120VAC	-	0	-	B
J-12	out	1Ø	MILSPEC	20	120VAC	-	0	-	B
J-13	out	1Ø	MILSPEC	20	120VAC	0	-	-	A
J-14	out	1Ø	MILSPEC	20	120VAC	0	-	-	A
					Total Phase Loads:	0	0	0	

Select Link Connections - DISE, Breaker Boxes, 2 and 3 Phase Consumers and Wye and FWH Adapter Display

The display for the **Select Link Connections** window for DISE and Breaker Boxes, 2 and 3 phase consumers, and Wye and FWH Adapters are all similar in that they only require the user to select a single connection for making the desired link. *This also applies when connecting a receptacle to a non-receptacle.* For receptacle-to-receptacle see Receptacle-to-Receptacle.

Connections are listed with input connections first. Details about each connection are provided:

- **Name** - The name of the connection
- **I/O** - Whether the connection is an input or output connection
- **# ∅** - The number of phases of the connection
- **Type** - The connector type of the connection
- **Rating (A)** - The rating of the connection, in Amps
- **Volts** - The rated voltage of the connection
- **Phase Loads** - The current load on each phase of the connection. If phase rotation has been set upstream of the item, then the option to view either generator phase loads or local phase loads is provided, as is shown in the above example.
- **Phase** - The phase of the connection.

***Note**: For single phase distribution items, this value is not known until the input of the*

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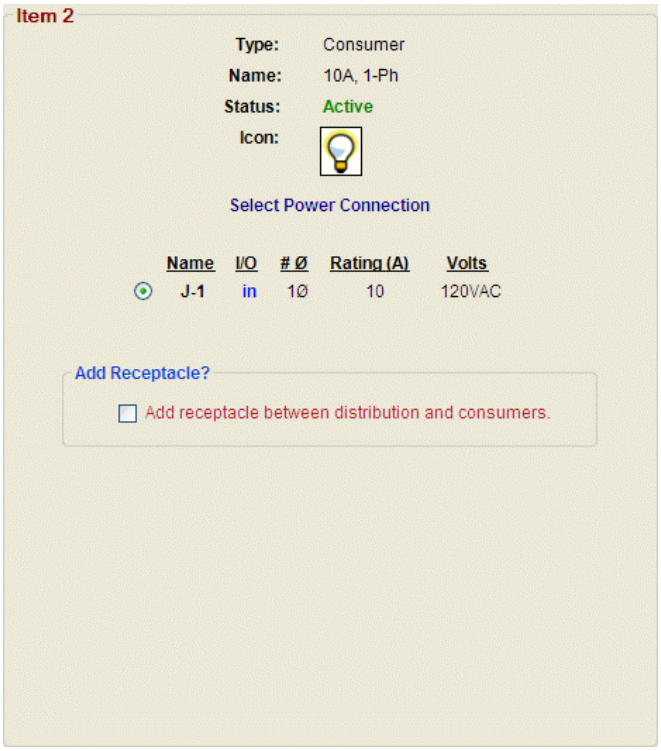
distribution item is connected to a connection where the phase has been determined.

Single Phase Consumers



Select Link Connections - Single Phase Consumer Display

The display for single phase consumers provides the option to **Add receptacle between distribution and consumers**. If this option is checked, AutoDISE will insert a receptacle between the distribution and the consumer, thereby creating two distinct links.

DC Consumers

DC consumers will connect to DC Rectifier or generator in DC mode without opening up the **Select Link Connections** window.

Receptacle-to-Receptacle

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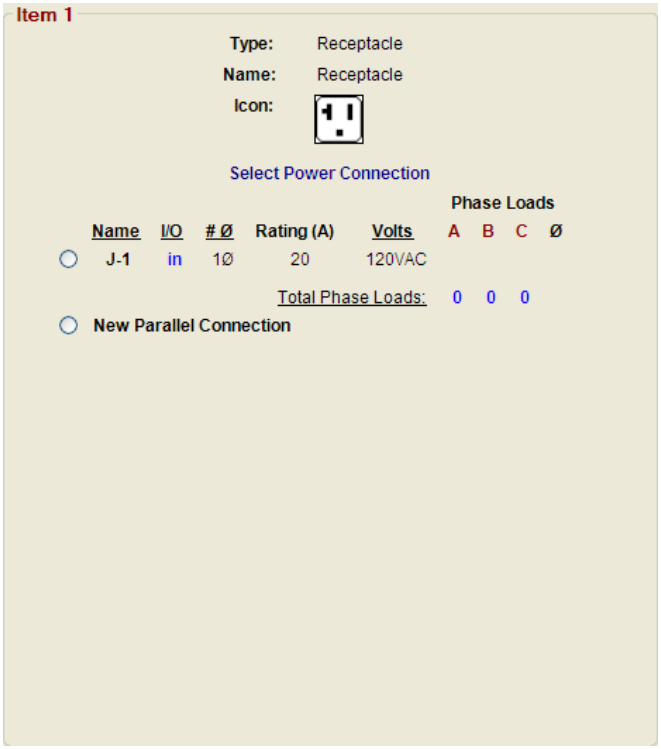

Select Link Connections - Receptacle-to-Receptacle Display

The display for receptacles connecting to other receptacles (also called "chaining receptacles") is unique in that it requires the user to specify which of the two receptacles is attached in parallel with the other, or, put another way, which receptacle is "downstream" of the other ("downstream" means further from the power source). The downstream receptacle will attach in parallel with the upstream receptacle by connecting its input connection to a **New Parallel Connection** on the upstream receptacle.

Universal Adapters

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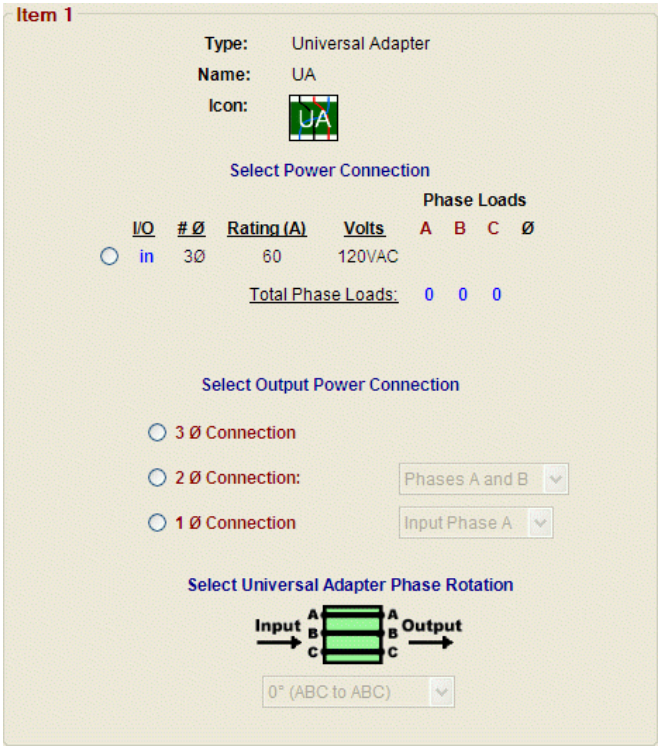

Select Link Connections - Universal Adapter Display

The display for universal adapters is similar to that for generators in that the user must select the number of phases of the output connection to the universal adapter posts.

Specifically, the user must select either a 1, 2 or 3 phase connection. In the case of a three phase connection, the user must also decide if any phase rotation will be accomplished via this connection, with the options to rotate phases by 0, 120 or 240 degrees. When selecting one or two phases for the connection, the user must select the precise phases they wish to connect to.

The universal adapter display also shows all items currently attached to the universal adapter, with information about the name of each item, the number of phases of the item and the local phase load due to the item.

***Note:** Universal adapters only allow one connection per phase post. Therefore, if items are already attached to the adapter when a new connection is being made, options for further connections will be limited to prevent more than one wire per post. For example, if a single-phase consumer is attached to phase B of the universal adapter, the three phase option will not be available for future connections and the two phase option will only allow connection to phases A and C.*

Transformers

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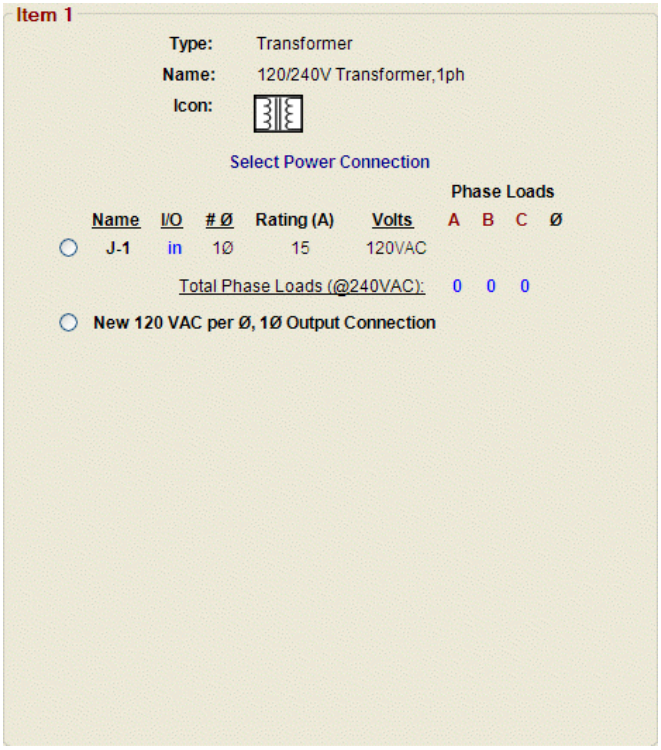
Item 1
Type: Transformer
Name: 120/240V Transformer,1ph
Icon:
Select Power Connection
Phase Loads
Name I/O # Ø Rating (A) Volts A B C Ø
J-1 in 1Ø 15 120VAC
Total Phase Loads (@240VAC): 0 0 0
New 120 VAC per Ø, 1Ø Output Connection

Select Link Connections - Transformer Display

If a transformer to another AC item, the transformer will display the current connected input item, if any, and a list of the current output items connected to the transformer. Note that the input and output voltages differ on a transformer, so connection must be selected that have matching AC voltages.

DC Rectifiers

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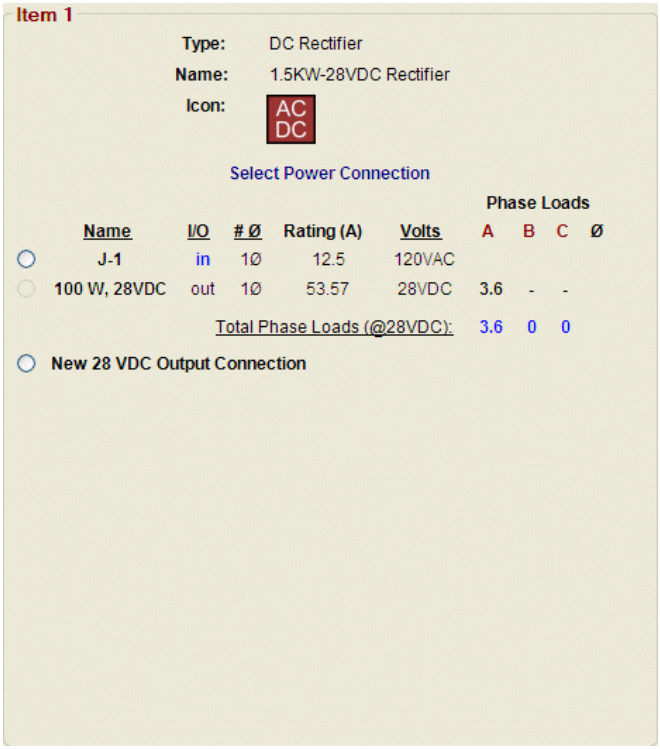
Item 1
Type: DC Rectifier
Name: 1.5KW-28VDC Rectifier
Icon:
AC
DC
Select Power Connection
Phase Loads
Name I/O # Ø Rating (A) Volts A B C Ø
J-1 in 1Ø 12.5 120VAC
100 W, 28VDC out 1Ø 53.57 28VDC 3.6 - -
Total Phase Loads (@28VDC): 3.6 0 0
New 28 VDC Output Connection

Select Link Connections - DC Rectifier Display

If connecting the input of an DC Rectifier to a single phase output, the rectifier will display its input connection and list the current DC loads on the rectifier. The **Phase Loads** will be shown in DC Amps.

Inverters

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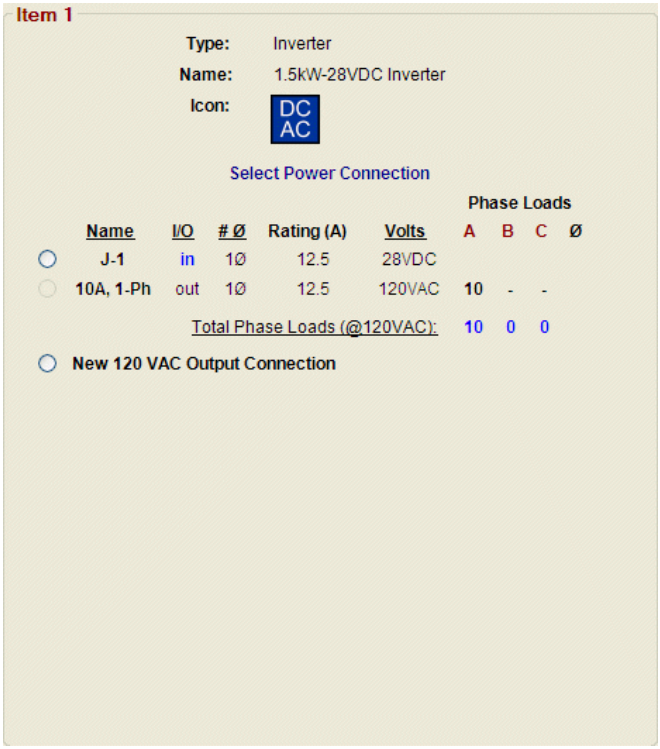
Item 1
Type: Inverter
Name: 1.5kW-28VDC Inverter
Icon:
DC
AC
Select Power Connection
Phase Loads
Name I/O # Ø Rating (A) Volts A B C Ø
J-1 in 1Ø 12.5 28VDC
10A, 1-Ph out 1Ø 12.5 120VAC 10 - -
Total Phase Loads (@120VAC): 10 0 0
New 120 VAC Output Connection

Select Link Connections - Inverter Display

If connecting the output of an inverter to an AC input connection, the inverter will display its input connection and list the current AC loads on the inverter. The **Phase Loads** will be shown in AC Amps.

13.20 AutoConnect Main Layout

The **AutoConnect Main Layout** window is used to specify parameters for AutoConnecting items on the main layout and shelter layouts.

See AutoConnect for how to activate this window.

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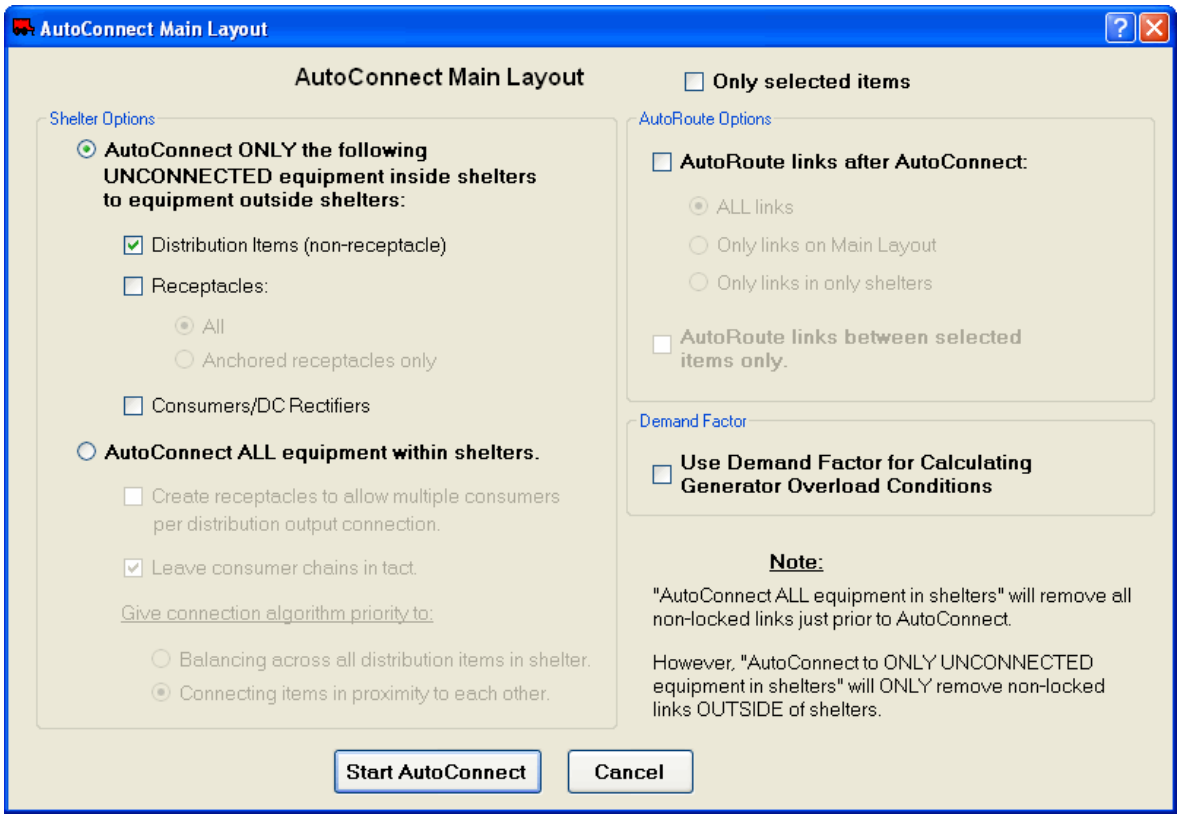
AutoConnect Main Layout
AutoConnect Main Layout
Only selected items
Shelter Options
AutoConnect ONLY the following UNCONNECTED equipment inside shelters to equipment outside shelters:
Distribution Items (non-receptacle)
Receptacles:
All
Anchored receptacles only
Consumers/DC Rectifiers
AutoConnect ALL equipment within shelters.
Create receptacles to allow multiple consumers per distribution output connection.
Leave consumer chains in tact.
Give connection algorithm priority to:
Balancing across all distribution items in shelter.
Connecting items in proximity to each other.
AutoRoute Options
AutoRoute links after AutoConnect:
ALL links
Only links on Main Layout
Only links in only shelters
AutoRoute links between selected items only.
Demand Factor
Use Demand Factor for Calculating Generator Overload Conditions
Note:
"AutoConnect ALL equipment in shelters" will remove all non-locked links just prior to AutoConnect.
However, "AutoConnect to ONLY UNCONNECTED equipment in shelters" will ONLY remove non-locked links OUTSIDE of shelters.
Start AutoConnect
Cancel

AutoConnect Main Layout Window

There are four main sections on this window:

1. **Only selected items**: Check this box to force AutoDISE to only run AutoConnect on items that are selected on the main layout.

   Note: If "only selected items" is checked and a shelter is selected on the main layout, then all items within that shelter are included in the AutoConnect algorithm.

2. **Shelter Options**: This section provides two options:

   - **AutoConnect only the following UNCONNECTED equipment inside shelters to equipment outside shelters -** This option is used when the user does not want to run the AutoConnect algorithm on all items inside a shelter. This might be the case if the user has already configured all links internal to a shelter and does not want them disturbed (locking the internal links would also be recommended in this case), but the user does want certain items in the shelter to connect to items outside the shelter.

     If this option is selected, the user must check which items inside the shelter may be connected to items outside the shelter. The options include non-receptacle distribution items, receptacles (either all receptacles or anchored receptacles only), and consumers.

     Note: The shelter items selected in this section will not be disconnected prior to

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running AutoConnect. Only items which are disconnected prior to running AutoConnect will be connected to items outside the shelter.

- **AutoConnect ALL equipment within shelters -** This option is equivalent to the user running AutoConnect within each shelter separately, then running AutoConnect on the main layout and connecting unconnected items in shelter to items outside shelters. Put another, way, this option AutoConnects EVERYTHING on a layout.

  Three sub-options are provided:

  a) ***Create receptacles to allow multiple consumers per distribution output connection -*** Without this option checked, one and only one single phase consumer may connect to a distribution single phase output connection. In many cases, this does not reflect real life since any myriad of receptacles or single phase distribution items such as power strips can be used to connect multiple consumers to a single output connection.

  To model this, AutoDISE allows receptacles to be automatically inserted between single phase consumers and single phase distribution output connections. This allows multiple single phase consumers to connect to the output connection. In fact, AutoConnect will intentionally prefer an output connection with a receptacle to another output connection of the same phase which does not.

  b) ***Leave consumer chains in tact*** - Since AutoDISE never automatically chains consumers, it is assumed that consumer chains are intentionally created by the user and, therefore, may want to be protected. If this option is checked, AutoConnect will NOT disconnect the links ***BETWEEN*** chained consumers.

  c) ***Give connection priority to...*** - In some cases, users may prefer that AutoConnect use ***proximity*** of items as the priority for making connections. This might be the case in situations where items have already been moved to desired locations in the shelter and the user wants items they have placed near each other to have priority when connecting. Otherwise, links could unrealistically jump around and be unnecessarily long. In this case, the user would select **Connecting items in proximity to each other.**

  However, in other cases the user may not really care how equipment is arranged spatially inside the shelter. Their concern may be primarily that consumers are distributed evenly, or balanced, across all distribution items in the shelter. In this case, the user would select **Balancing across all distribution items in the shelter.**

3. **AutoRoute Options**: In this section the user may select how and where the AutoRoute algorithm is run after AutoConnect is complete. To run AutoRoute after AutoConnect, check **AutoRoute links after AutoConnect.**

   The user then has the option of AutoRouting all links, AutoRouting only links on the main layout or AutoRouting only links in any open shelter layout. Additionally, the user can

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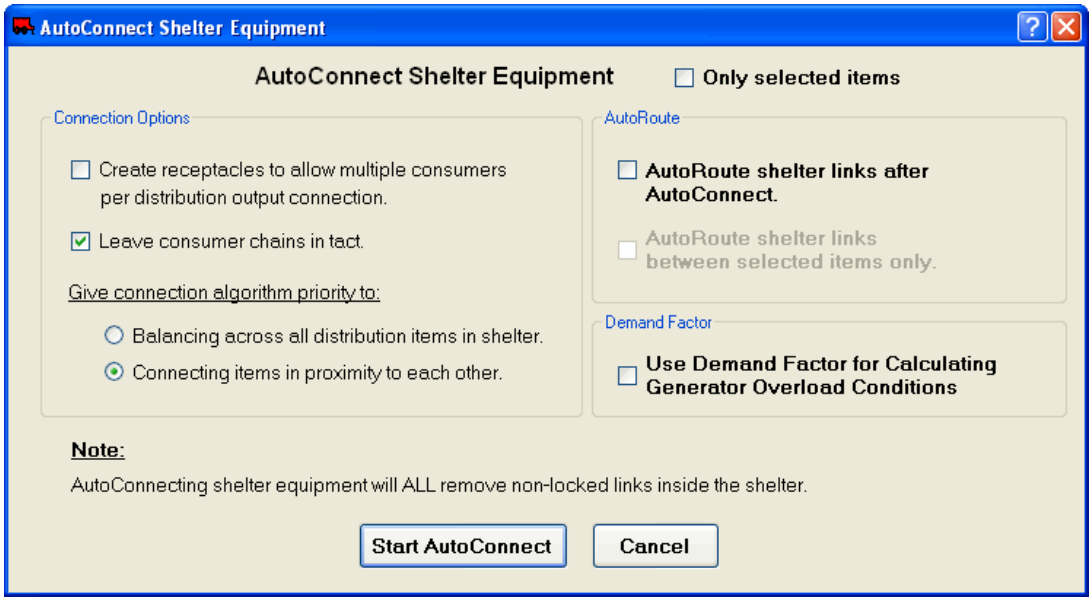
restrict the AutoRoute to only links between selected items.

4. **Demand Factor**: AutoConnect provides the option of whether to use the demand factor for calculating generator overload conditions. AutoConnect will never intentionally overload a generator. If this option is checked, AutoConnect will determine whether the generator is overloaded by using the consumer loads with demand factor included in the calculation. This will allow more loads to be connected to the generator if shelter or main layout demand factors are less than unity and when the generator maximum load is the restrictive item in the calculations. ***Note: Demand factors do NOT affect the determination of whether distribution equipment is overloaded.***

13.21 AutoConnect Shelter Equipment

The **AutoConnect Shelter Equipment** window is used to specify parameters for AutoConnecting items within a shelter layout .

See AutoConnect for how to activate this window.


AutoConnect Shelter Equipment
AutoConnect Shelter Equipment
Only selected items
Connection Options
Create receptacles to allow multiple consumers per distribution output connection.
Leave consumer chains in tact.
Give connection algorithm priority to:
Balancing across all distribution items in shelter.
Connecting items in proximity to each other.
AutoRoute
AutoRoute shelter links after AutoConnect.
AutoRoute shelter links between selected items only.
Demand Factor
Use Demand Factor for Calculating Generator Overload Conditions
Note:
AutoConnecting shelter equipment will ALL remove non-locked links inside the shelter.
Start AutoConnect
Cancel

AutoConnect Shelter Equipment Window

There are four main sections on this window:

1. **Only selected items**: Check this box to force AutoDISE to only run AutoConnect on items that are selected on the shelter layout.

2. **Connection Options**: This section provides two options:

   - ***Use receptacles to allow multiple consumers per distribution output connection -*** Without this option checked, one and only one single phase consumer may connect to a distribution single phase output connection. In many cases, this does not reflect real life since any myriad of receptacles or single phase distribution items such as power strips

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can be used to connect multiple consumers to a single output connection.

To model this, AutoDISE allows receptacles to be automatically inserted between single phase consumers and single phase distribution output connections. This allows multiple single phase consumers to connect to the output connection. In fact, AutoConnect will intentionally prefer an output connection with a receptacle to another output connection of the same phase which does not.

- ***Leave consumer chains in tact*** - Since AutoDISE never automatically chains consumers, it is assumed that consumer chains are intentionally created by the user and, therefore, may want to be protected. If this option is checked, AutoConnect will NOT disconnect the links ***BETWEEN*** chained consumers.

- ***Give connection priority to...*** - In some cases, users may prefer that AutoConnect use ***proximity*** of items as the priority for making connections. This might be the case in situations where items have already been moved to desired locations in the shelter and the user wants items they have placed near each other to have priority when connecting. Otherwise, links could unrealistically jump around and be unnecessarily long. In this case, the user would select **Connecting items in proximity to each other.**

  However, in other cases the user may not really care how equipment is arranged spatially inside the shelter. Their concern may be primarily that consumers are distributed evenly, or balanced, across all distribution items in the shelter. In this case, the user would select **Balancing across all distribution items in the shelter.**

3. **AutoRoute Options**: In this section the user may select how and where the AutoRoute algorithm is run after AutoConnect is complete. To run AutoRoute after AutoConnect, check **AutoRoute shelter links after AutoConnect.** Additionally, the user can restrict the AutoRoute to only links between selected items.

4. **Demand Factor**: AutoConnect provides the option of whether to use the demand factor for calculating generator overload conditions. AutoConnect will never intentionally overload a generator. If this option is checked, AutoConnect will determine whether the generator is overloaded by using the consumer loads with demand factor included in the calculation. This will allow more loads to be connected to the generator if shelter or main layout demand factors are less than unity and when the generator maximum load is the restrictive item in the calculations. ***Note: Demand factors do NOT affect the determination of whether distribution equipment is overloaded.***

13.22 Import Toolbox Items From Another Computer

The **Import Toolbox Items From Another Computer** window allows a user to transfer all user-defined Toolbox item information from another computer.

Open this window by selecting **Import Toolbox Items From Another Computer** from the Toolbox Menu.

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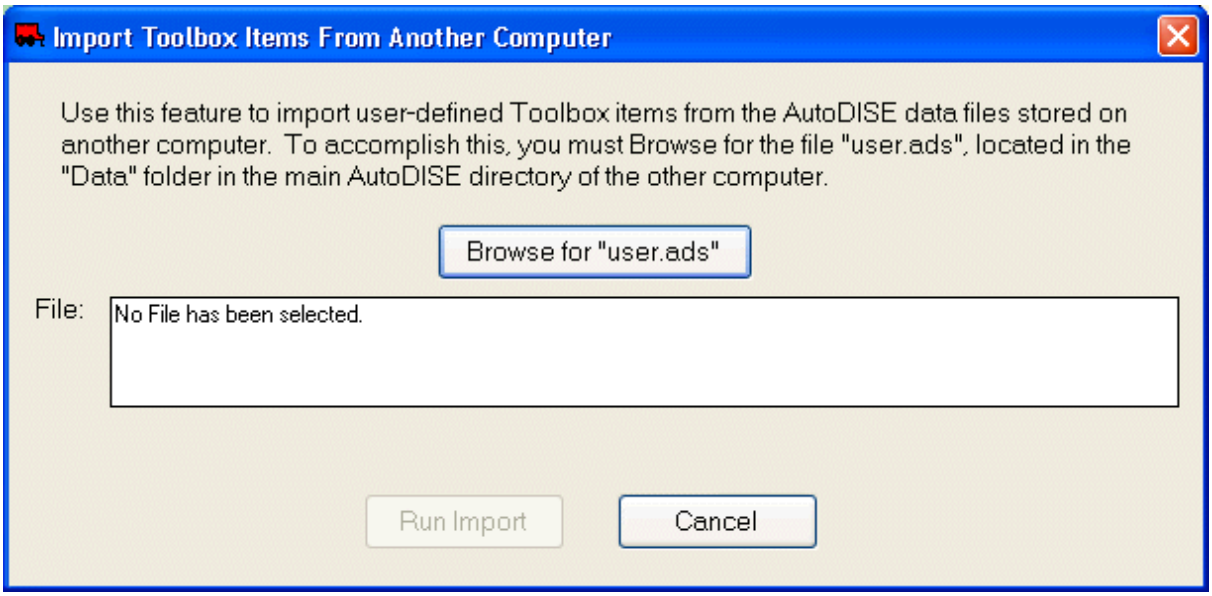
To use this window, first browse for the file named "**user.ads**", located in the "Data" folder in the main AutoDISE directory of the other computer. Once the file is found, its file path will show in the **File** textbox and the **Run Import** button will be enabled. Click the **Run Import** button to begin the import process.


Import Toolbox Items From Another Computer
Use this feature to import user-defined Toolbox items from the AutoDISE data files stored on another computer. To accomplish this, you must Browse for the file "user.ads", located in the "Data" folder in the main AutoDISE directory of the other computer.
Browse for "user.ads"
File:
No File has been selected.
Run Import
Cancel

Import Toolbox Items From Another Computer Window

This opens the **Select Items to Import** window, where the user can view and select which items from the other Toolbox they wish to actually transfer. In this window, check the items desired. The user may also rename items as desired.

> ***Note: All items in the Toolbox must have unique names. Any item being imported that has a name identical to a name already in the Toolbox is annotated with a red asterisk (*). These items, if selected for import, MUST be renamed in order to add them to the Toolbox.***

When ready, click the **OK** button to finish import.

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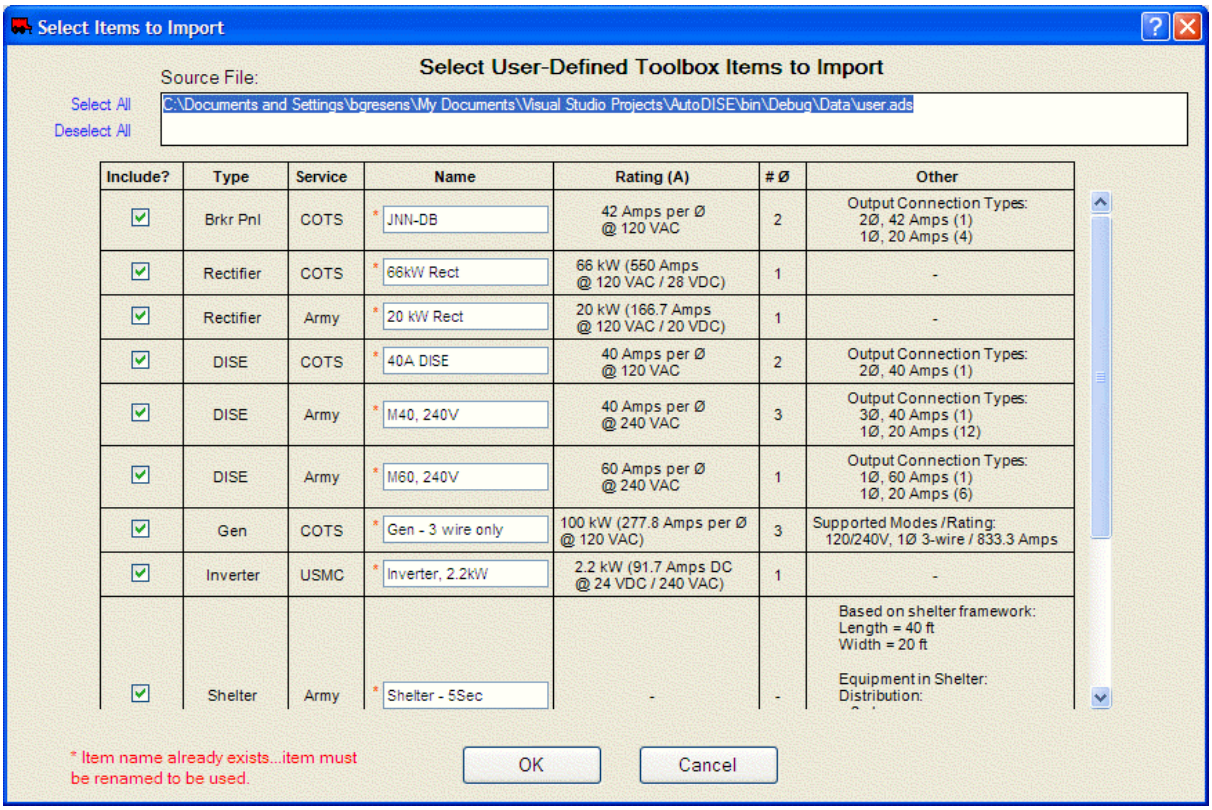
Select Items to Import
Select User-Defined Toolbox Items to Import
Source File:
Select All
Deselect All
C:\Documents and Settings\bgresens\My Documents\Visual Studio Projects\AutoDISE\bin\Debug\Data\user.ads
Include? | Type | Service | Name | Rating (A) | # Ø | Other
Brkr Pnl | COTS | JNN-DB | 42 Amps per Ø @ 120 VAC | 2 | Output Connection Types: 2Ø, 42 Amps (1) 1Ø, 20 Amps (4)
Rectifier | COTS | 66kW Rect | 66 kW (550 Amps @ 120 VAC / 28 VDC) | 1 | -
Rectifier | Army | 20 kW Rect | 20 kW (166.7 Amps @ 120 VAC / 20 VDC) | 1 | -
DISE | COTS | 40A DISE | 40 Amps per Ø @ 120 VAC | 2 | Output Connection Types: 2Ø, 40 Amps (1)
DISE | Army | M40, 240V | 40 Amps per Ø @ 240 VAC | 3 | Output Connection Types: 3Ø, 40 Amps (1) 1Ø, 20 Amps (12)
DISE | Army | M60, 240V | 60 Amps per Ø @ 240 VAC | 1 | Output Connection Types: 1Ø, 60 Amps (1) 1Ø, 20 Amps (6)
Gen | COTS | Gen - 3 wire only | 100 kW (277.8 Amps per Ø @ 120 VAC) | 3 | Supported Modes /Rating: 120/240V, 1Ø 3-wire / 833.3 Amps
Inverter | USMC | Inverter, 2.2kW | 2.2 kW (91.7 Amps DC @ 24 VDC / 240 VAC) | 1 | -
Shelter | Army | Shelter - 5Sec | - | - | Based on shelter framework: Length = 40 ft Width = 20 ft Equipment in Shelter: Distribution:
* Item name already exists...item must be renamed to be used.
OK
Cancel

Select Items to Import Window

13.23 Manual Program Updates

The **Manual Program Updates** window is used to update the AutoDISE program when automatic updates are not available, such as when Internet service is not available. In such situations, a valid AutoDISE manual update file must be saved on the client machine in an accessible location, most likely via a removable media such as a CD-ROM. Manual update files are located on the AutoDISE Web Site.

To open the **Manual Program Updates** window, select **Manual Program Updates** from the Updates Menu.

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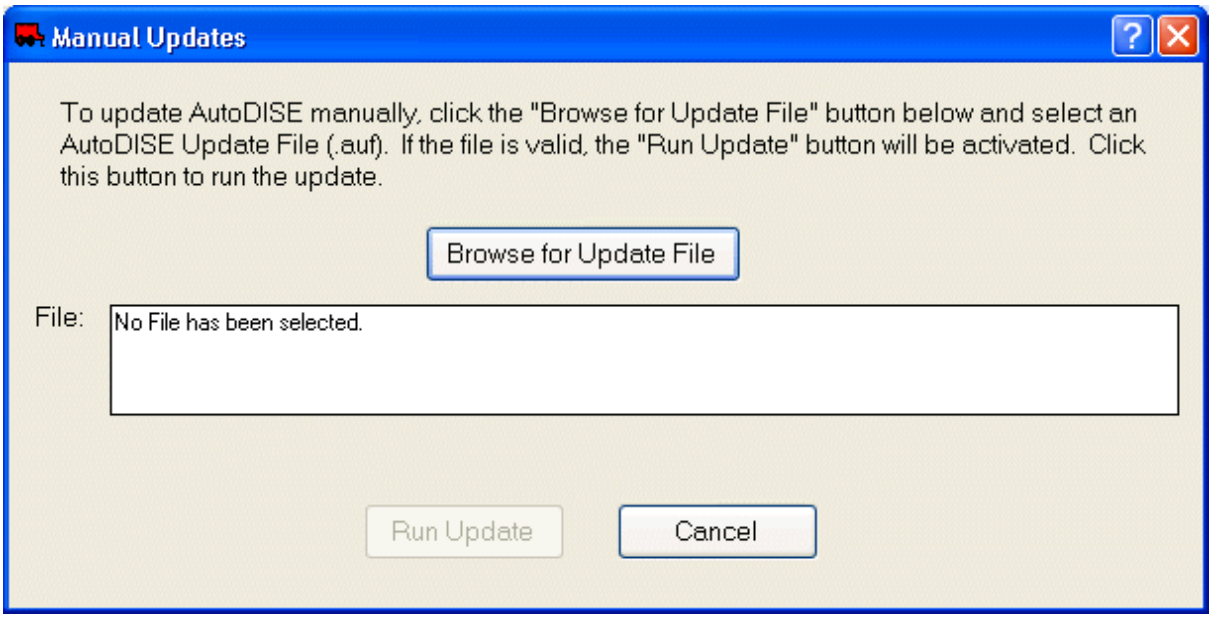
Manual Updates
To update AutoDISE manually, click the "Browse for Update File" button below and select an AutoDISE Update File (.auf). If the file is valid, the "Run Update" button will be activated. Click this button to run the update.
Browse for Update File
File:
No File has been selected.
Run Update
Cancel

Manual Updates Window

To perform a manual update, browse for a valid update file (.auf file). If a valid file is found, the **Run Update** button will be enabled. Click the **Run Update** button to perform the update.

13.24 Staking Windows

13.24.1 Passageway Manager

The **Passageway Manager** provides functionality for adding, editing and removing passageways from the AutoDISE toolbox.

To open the **Passageway Manager**, select **Passageway Manager** from the **Staking** menu on the Main Menu.

The **Passageway Manager** window is shown below:

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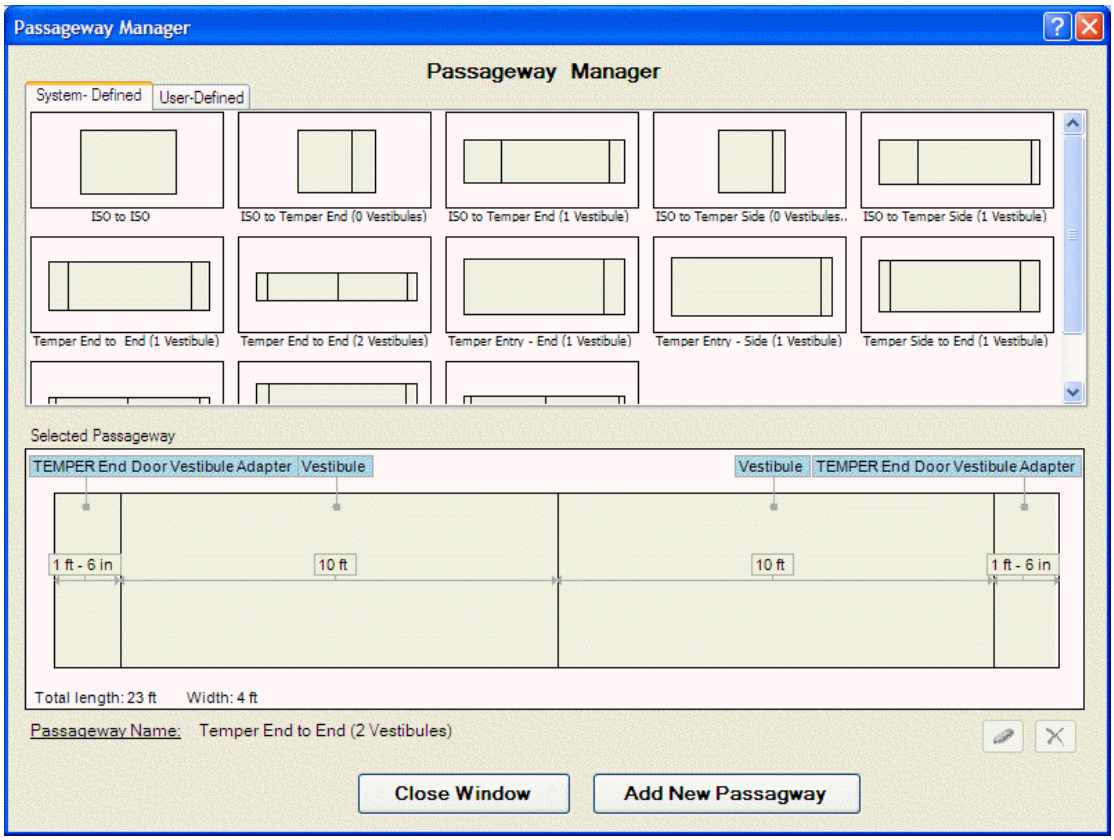

Passageway Manager Window

The window groups passageways into two categories: **System-Defined** and **User-Defined.** Only user-defined passageways may be edited and/or deleted.

Adding a New Passageway

To add a new user-defined passageway, click on the **Add New Passageway** button at the bottom of the window. This opens the **Edit Passageway Components** window. See Edit Passageway Components for information on this window.

Editing an Existing User-Defined Passageway

To edit an existing user-defined passageway, click on the **User-Defined** tab at the top of the window and click on the desired passageway. Details about the desired passageway now appear in the **Selected Passageway** section.

Finally, click the **Edit Passageway** button at the lower right of the window to open the **Edit Passageway Components** window. See Edit Passageway Components for information on this window.

Delete an Existing User-Defined Passageway

To delete an existing user-defined passageway, click on the **User-Defined** tab at the top of the

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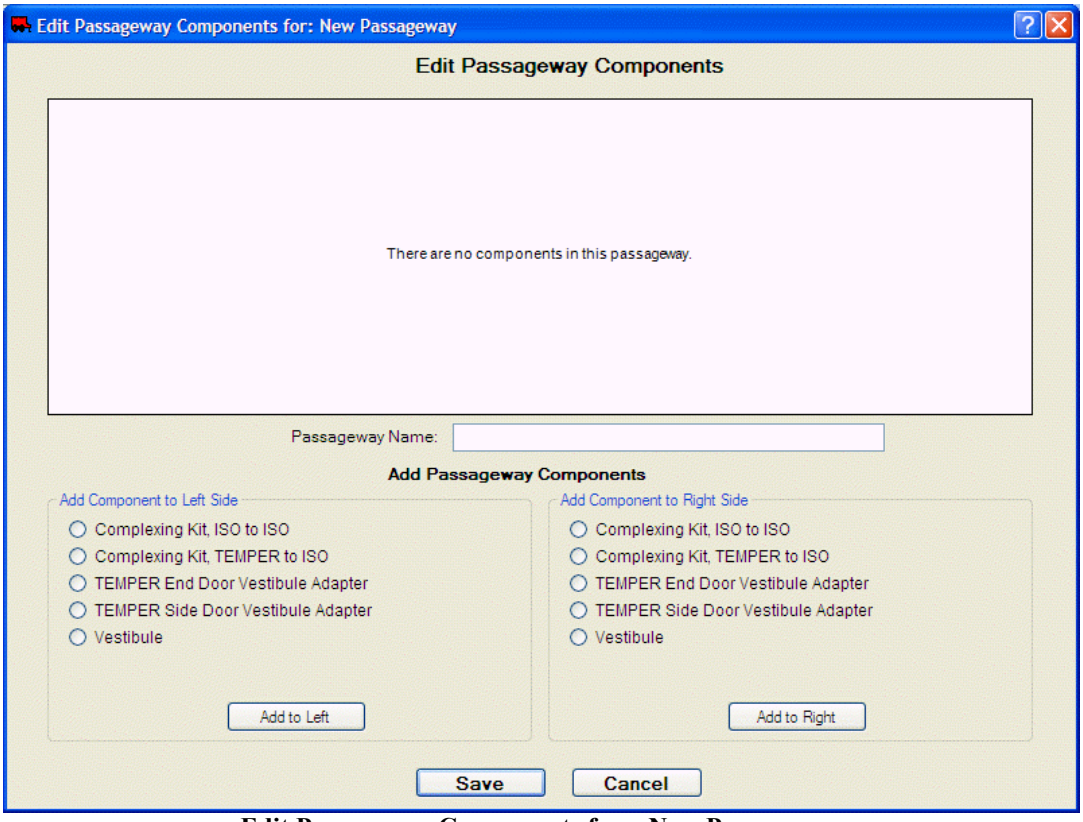
window and click on the desired passageway. Details about the desired passageway now appear in the **Selected Passageway** section. Finally, click the **Delete Passageway** button at the lower right of the window. Following a dialog confirmation, the passageway will be deleted from the Toolbox.

13.24.1.1 Edit Passageway Components

The **Edit Passageway Components** window allows a user to edit the passageway adapters and vestibules that make up a passageway.

Edit Passageway Components for a New Passageway

The **Edit Passageway Components** window for a new passageway is shown below:



Edit Passageway Components for a New Passageway

Initially, the passageway contains no components. The two areas at the bottom of the window, **Add Components to Left Side** and **Add Components to Right Side**, are utilized to add the first component and then attach components to either the left or right sides of the existing components. Note that both sections contain identical components, a collection of all passageway adapters and vestibules that are available in the current version of AutoDISE.

Components may be added in any order and at either end. Once at least one component is added, the options available on the respective sides will be enabled or disabled to permit the user to only connect subsequent components to that side that match in passageway connector

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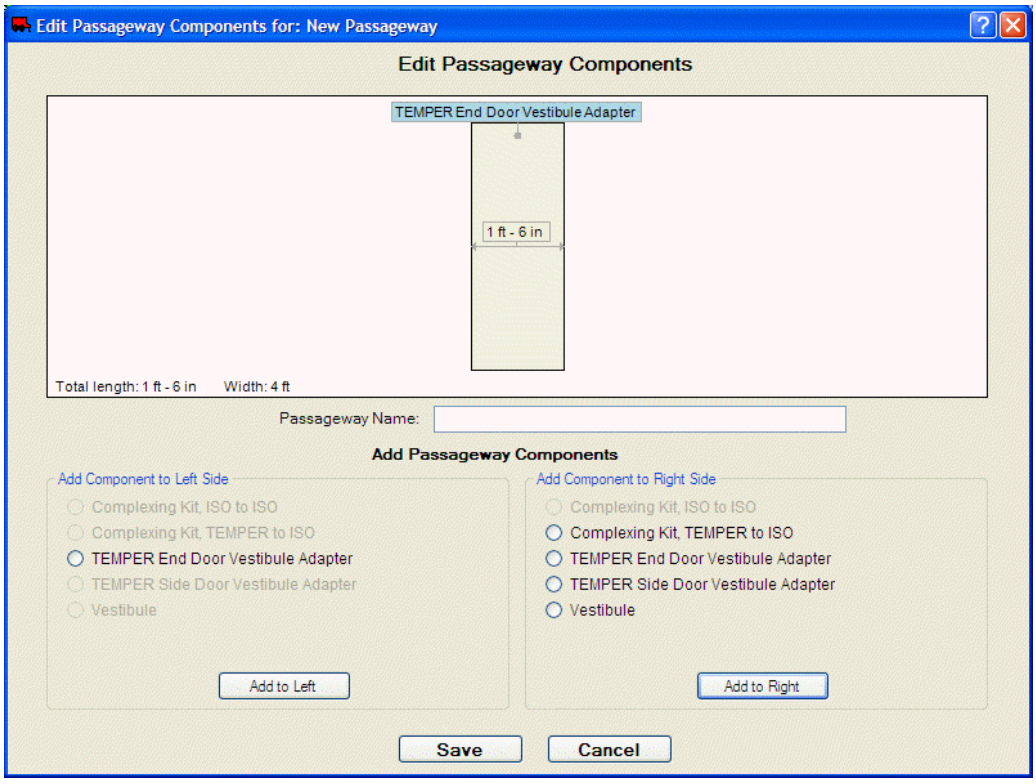
type.

For example, assume a user would like to build a passageway with a TEMPER End Door Vestibule Adapter on one end, a TEMPER Side Door Vestibule Adapter on the other end, and three vestibules in between:

1. Add a TEMPER End Door Vestibule Adapter at either end by selecting it from the options and clicking either the **Add to Left** or **Add to Right** buttons depending on which side is chosen. The window now looks like this:



***Note**: Notice how the options have been disabled to reflect that the left side of the TEMPER End Door Vestibule Adapter as shown will only connect to another TEMPER End Door Vestibule Adapter since this adapter is the only component that has one end of the TEMPER End Door passageway connector type. The right side is of the vestibule passageway connector type and all components EXCEPT the Complexing Kit, ISO to ISO have at least one end of this type.*

***Note**: The orientation of the passageway in this view is arbitrary and does not matter. When a passageway is used in building a staking layout it is rotated as necessary to fit the matching passageway connector types.*

2. Since in this view the vestibules may only be attached to the right side, add three vestibules by selecting the **Vestibule** option from the right side and clicking the **Add to Right** button three times. You will need to reselect the **Vestibule** option after each

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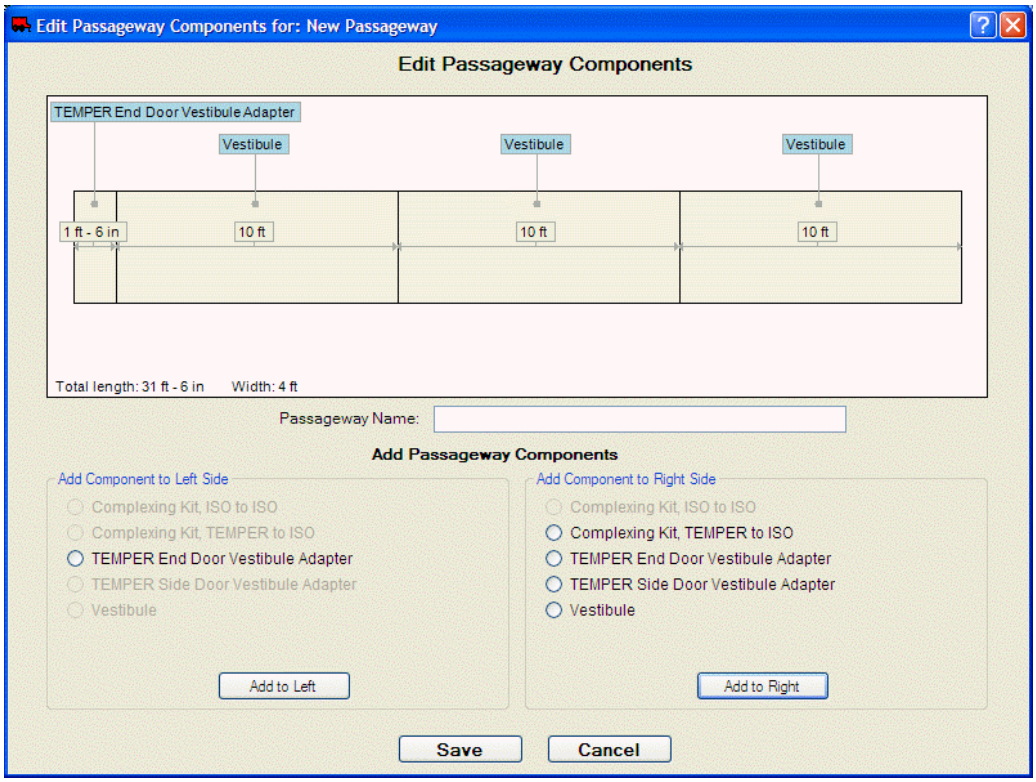
click of the button.

The window now looks like this:



3. Finally, add a TEMPER Side Door Vestibule Adapter to the right side by selecting this option from the right side and clicking the **Add to Right** button.

   The window now looks like this:

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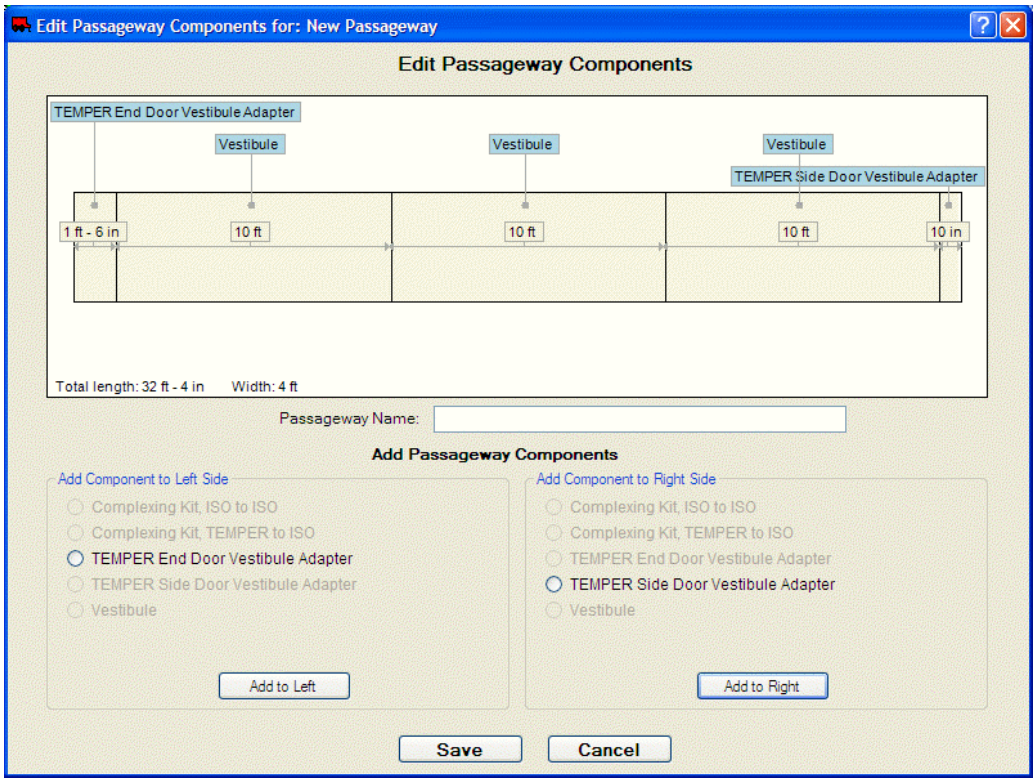

4. If at any point in this process a components must be removed from the display, simply right-click on the component in the display and select **Remove Component** from the menu that appears.

5. The passageway is built. Provide a name in the **Passageway Name** field and click **Save** or **Cancel** to exit without saving.

Edit Passageway Components for a New Passageway

When editing an existing passageway, the **Edit Passageway Components** window will open with the existing passageway components in the display.

To remove existing components, simply right-click on the component in the display and select **Remove Component** from the menu that appears.

To add new components, use the steps detailed above for **Edit Passageway Components for a New Passageway.**

13.24.2 Staking View Options

The **Staking View Options** window provides the ability to modify what types of information is being displayed on the Staking View.

To open the **Staking View Options** window,

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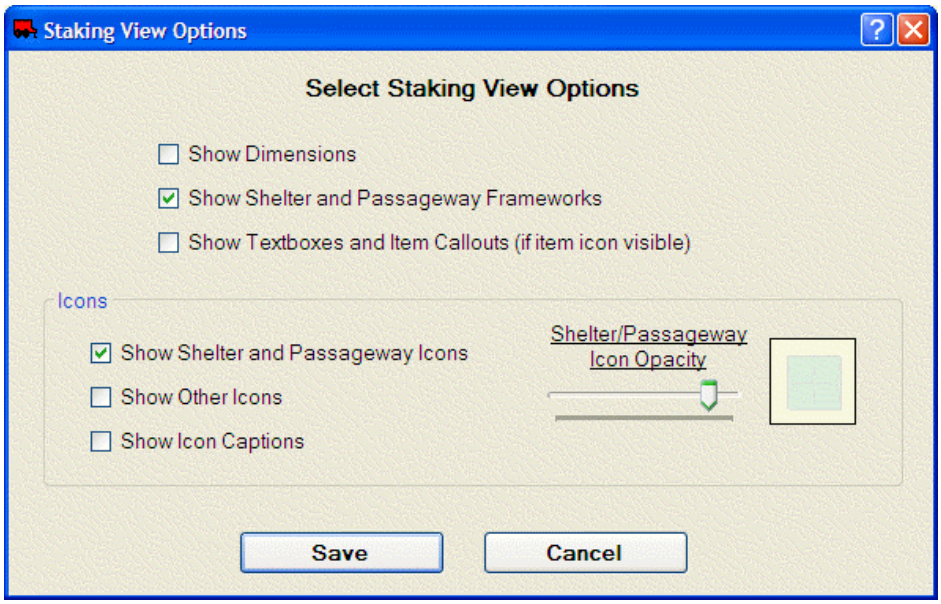
1. Ensure AutoDISE is in the Staking View by clicking on the **Staking** tab.
2. Click on the **Staking View Options** button on the Main Toolbar.

The **Staking View Options** window is shown below:



Staking View Options Window

- **Show Dimensions**: Shows all automated and custom staking dimensions.
- **Show Shelter and Passageway Frameworks**: Shows all shelter and passageway frameworks.
- **Show Textboxes and Item Callouts**: Shows all textboxes and item callouts for items whose icons are visible in the staking layout.
- **Show Shelter and Passageway Icons**: Shows all shelter and passageway icons.
- **Show Other Icons**: Shows all non-shelter and non-passageway icons.
- **Show Icon Captions**: Shows all icon captions .
- **Shelter/Passageway Icon Opacity**: Adjusts the opacity of shelter and passageway icons on the layout to permit easier viewing of frameworks or dimensions. This is particularly useful if icons are dark and tend to hide the lines that define frameworks and dimensions.

Click the **Save** button to save changes or **Cancel** to exit without saving.

13.25 HVAC Requirements Calculator Window

The **HVAC Requirements Calculator** window is the primary window for utilizing the HVAC Requirements Calculator. The HVAC Requirements Calculator is used to calculate the size of air-conditioning or heating units to keep a shelter at a specified constant temperature.

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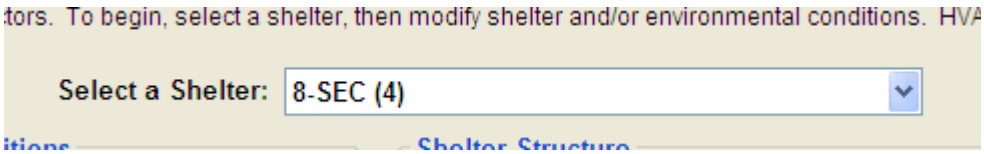
To open the window, either:

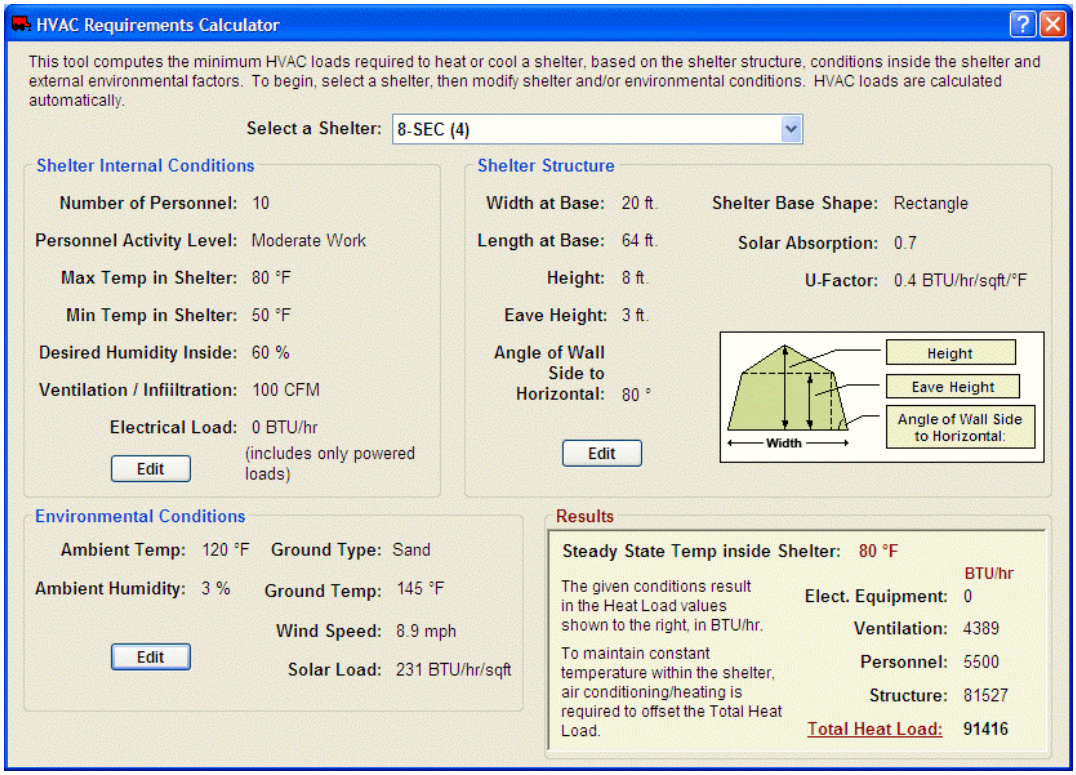
- Click on the **HVAC Requirements Calculator** button on the Main Toolbar, or
- While in the Main Layout View, right-click on a shelter and select **HVAC Requirements Calculator** from the menu that appears.

If the first method was used, the user will then need to select a shelter from the drop-down list at the top of the window.



Shelter Drop-down List

Once complete, the HVAC Requirements Calculator window will look like this:


HVAC Requirements Calculator
This tool computes the minimum HVAC loads required to heat or cool a shelter, based on the shelter structure, conditions inside the shelter and external environmental factors. To begin, select a shelter, then modify shelter and/or environmental conditions. HVAC loads are calculated automatically.
Select a Shelter: 8-SEC (4)
Shelter Internal Conditions
Number of Personnel: 10
Personnel Activity Level: Moderate Work
Max Temp in Shelter: 80 °F
Min Temp in Shelter: 50 °F
Desired Humidity Inside: 60 %
Ventilation / Infiltration: 100 CFM
Electrical Load: 0 BTU/hr
(includes only powered loads)
Edit
Shelter Structure
Width at Base: 20 ft.
Length at Base: 64 ft.
Height: 8 ft.
Eave Height: 3 ft.
Angle of Wall Side to Horizontal: 80 °
Edit
Shelter Base Shape: Rectangle
Solar Absorption: 0.7
U-Factor: 0.4 BTU/hr/sqft/°F
Height
Eave Height
Angle of Wall Side to Horizontal:
Width
Environmental Conditions
Ambient Temp: 120 °F
Ambient Humidity: 3 %
Ground Type: Sand
Ground Temp: 145 °F
Wind Speed: 8.9 mph
Solar Load: 231 BTU/hr/sqft
Edit
Results
Steady State Temp inside Shelter: 80 °F
The given conditions result in the Heat Load values shown to the right, in BTU/hr.
To maintain constant temperature within the shelter, air conditioning/heating is required to offset the Total Heat Load.
BTU/hr
Elect. Equipment: 0
Ventilation: 4389
Personnel: 5500
Structure: 81527
Total Heat Load: 91416

The HVAC Requirements Calculator Window

As shown in the Results area in the lower right corner of the window, the **Total Heat Load** inside a shelter is a function of four factors: electrical equipment, ventilation, personnel and the structure. See HVAC Requirements Calculator for a detailed description of each factor.

The calculation of each of these four factors is dependent on the internal conditions of the shelter, how the shelter is structured and what material it is made of, and the environmental conditions external to the shelter. Each of these areas may be modified individually. As

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changes are made, the **Results** section is updated immediately to reflect the new values.

Modifying Shelter Internal Conditions

Shelter internal conditions include the number of personnel in the shelter and their level of activity, the maximum and minimum desired temperature, the inside humidity and the amount of ventilation/infiltration of air from the environment. The shelter internal conditions may be modified by clicking the **Edit** button in the **Shelter Internal Conditions** section of the window. This opens the Modify Shelter Internal Conditions window. Make appropriate changes and save to return to the main window.

Modifying Shelter Structure

Shelter structure settings define the 3-dimensional geometry of the shelter, as well the Solar Absorption and U-Factor of the shelter skin material. The shelter structure settings may be modified by clicking the **Edit** button in the **Shelter Structure** section of the window. This opens the Modify Shelter Structure window. Make appropriate changes and save to return to the main window.

> ***Note:*** ***If the Shelter Base Shape is set to Rectangular Dome, then the Eave Height and Angle of Wall Side to Horizontal have no meaning and will be disabled in this window.***

Modifying Environmental Conditions

Environmental conditions may be modified by clicking the **Edit** button in the **Environmental Conditions** section of the window. This opens directly to the Environment Properties tab of the Layout Properties window. Make appropriate changes and save to return to the main window.

13.25.1 Modify Shelter Internal Conditions

The **Modify Shelter Internal Conditions** window permits the user to modify shelter internal conditions for the HVAC Requirements Calculator window. Shelter internal conditions include the number of personnel in the shelter and their level of activity, the maximum and minimum desired temperature, the inside humidity and the amount of ventilation/infiltration of air from the environment

To open the **Modify Shelter Internal Conditions** window, click the **Edit** button in the **Shelter Internal Conditions** section of the HVAC Requirements Calculator window.

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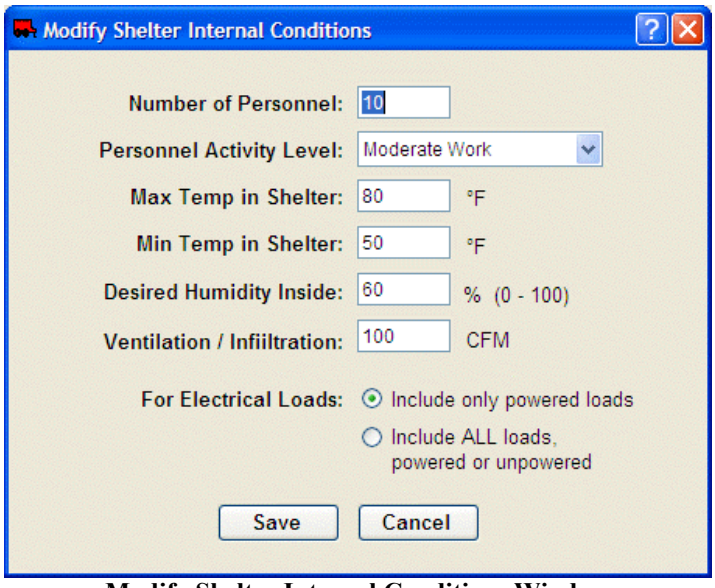

Modify Shelter Internal Conditions Window

The following fields may be edited:

- **Number of Personnel**: The number of individuals in the shelter.
- **Personnel Activity Level**: The activity level, on average, of the individuals in the shelter. Options include:

    1. At Rest
    2. Light Office Activity
    3. Moderate Work
    4. Light Bench Work
    5. Heavy Bench Work

- **Max Temp in Shelter**: The highest desired temperature inside the shelter.
- **Min Temp in Shelter**: The lowest desired temperature inside the shelter.
- **Desired Humidity Inside**: The desired humidity inside the shelter.
- **Ventilation/Infiltration**: The amount of air, in cubic feet per minute (CFM), ventilated into or infiltrating the shelter from the outside:

    1. ***Ventilation*** is the intentional forced addition of outside air into the shelter. The minimum ventilation requirement is 10 CFM per shelter occupant.
    2. ***Infiltration*** results from wind penetration into the shelter through entrances into the shelter. It is sometimes assumed that the entire volume of the shelter is replaced every hour due to infiltration.

A good estimate of ventilation/infiltration for most shelters is 10 CFM per shelter occupant.

- **Electrical Load Power Option**: Specify whether the Electrical Load includes only

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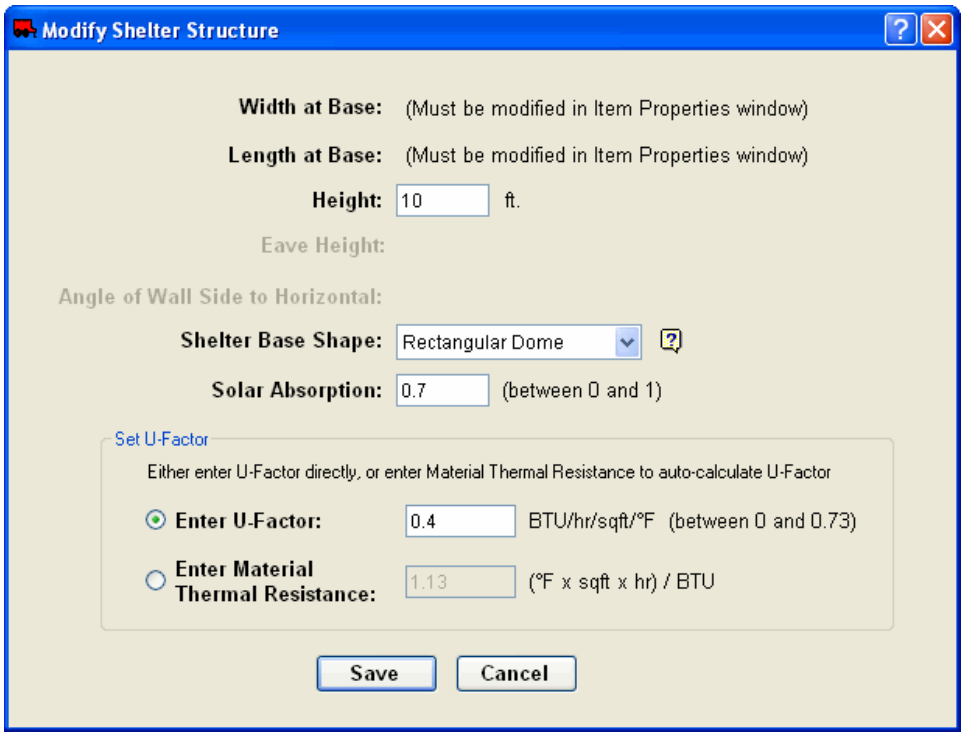
powered loads or also includes unpowered loads as if they were actually powered. "Powered" loads means they are "active". See Consumer Right-click Options.

Click the **Save** button to save changes or the **Cancel** button to exit without saving.

13.25.2 Modify Shelter Structure

The **Modify Shelter Structure** window permits the user to modify shelter structure settings for the HVAC Requirements Calculator window. Shelter structure settings include the width, length, height and other geometrical properties that define the shape of the structure, as well as the Solar Absorption and U-Factor of the material of which the shelter is built.

To open the **Modify Shelter Structure** window, click the **Edit** button in the **Shelter Structure** section of the HVAC Requirements Calculator window.


Modify Shelter Structure
Width at Base: (Must be modified in Item Properties window)
Length at Base: (Must be modified in Item Properties window)
Height: 10 ft.
Eave Height:
Angle of Wall Side to Horizontal:
Shelter Base Shape: Rectangular Dome
Solar Absorption: 0.7 (between 0 and 1)
Set U-Factor
Either enter U-Factor directly, or enter Material Thermal Resistance to auto-calculate U-Factor
Enter U-Factor: 0.4 BTU/hr/sqft/°F (between 0 and 0.73)
Enter Material Thermal Resistance: 1.13 (°F x sqft x hr) / BTU
Save
Cancel

Modify Shelter Structure Window

Note: The Width at Base and Length at Base are properties that affect the structure of the shelter, but which must be modified in the Item Properties window.

The following fields may be edited:

- **Height**: The height from the ground to the tallest point on the shelter. See image below.
- **Eave Height**: The height from the ground to the top of the side wall. See image below
- **Angle of Wall Side to Horizontal**: The angle between the horizontal ground and the wall side. See image below.

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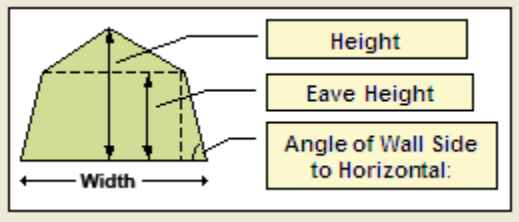

Height, Eave Height and Angle of Wall Side to Horizontal

Note: ***If the Shelter Base Shape is set to Rectangular Dome, then the Eave Height and Angle of Wall Side to Horizontal have no meaning and will be disabled in this window.***

- **Shelter Base Shape**: The basic shape of the shelter. Options include:

  1. Rectangle
  2. Hexagon
  3. Octagon
  4. Rectangular Dome

- **Solar Absorption**: A dimensionless property of the shelter skin material that determines the fraction of long wave solar radiation absorbed by the material. Solar absorption, or "solar absorptivity", ranges between 0 and 1. A perfectly transparent material that absorbs no long wave solar radiation, such as clear glass, has a solar absorption of 0. A black material that absorbs ALL long wave solar radiation would have a solar absorption of 1. Typical Army shelter materials have a solar absorption value of approximately 0.7.

- **U-Factor**: The overall heat transfer coefficient, or conductance, of an insulating material. The U-Factor of an insulator includes its thermal resistance, which itself is dependent on material thickness, and natural convection films on either side of the insulator. More specifically, this coefficient represents the total heat flow per unit area per unit time through a material given the material properties, material thickness, convection conditions on both sides of the material and temperature difference between the two sides of the material.

  Note: ***Since this coefficient is dependent on such a wide variety of factors, it is extremely difficult to calculate and typically requires the user to input a value that is an average for a variety of conditions and materials. While U-Factors are oftentimes stated for windows, U-Factors for military shelters may be difficult to find. For that reason, the AutoDISE user who does not have access to such numbers should use the accepted Army default value of 0.4 BTU/hr/sqft/°F.***

  AutoDISE provides the option of entering the U-Factor directly, or entering instead the Material Thermal Resistance in (°F x sq.ft. x hr) / BTU. If this option is used, AutoDISE will automatically calculate the U-Factor using the equation:

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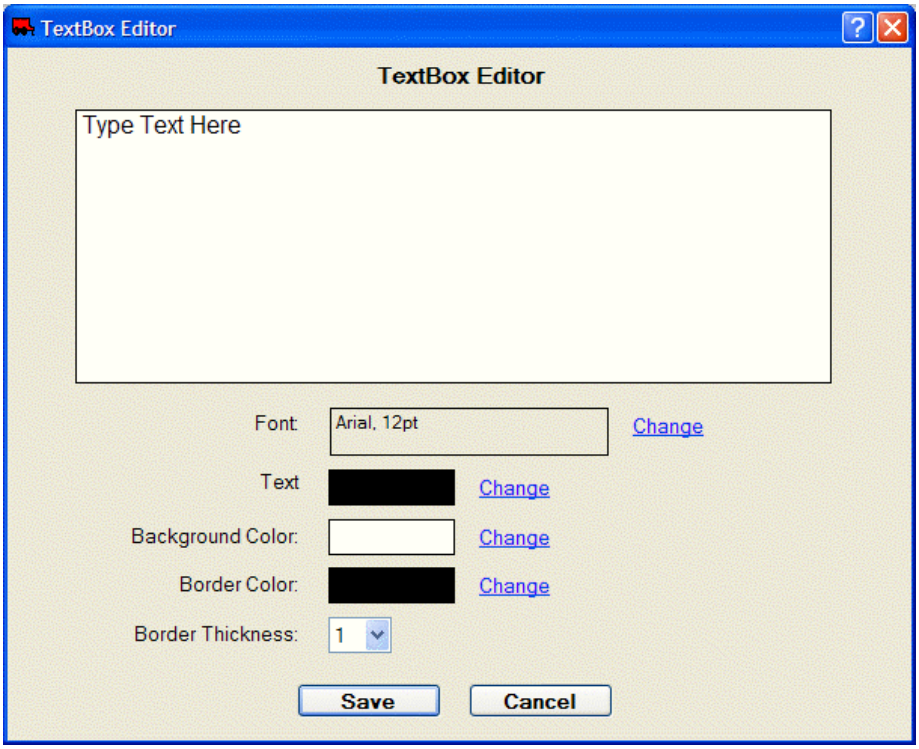
U-Factor = 1 / (R + (2 / hv)) where R = Material Thermal Resistance and hv = natural convection coefficient = 1.46

Click the **Save** button to save changes or the **Cancel** button to exit without saving.

13.26 Textbox Editor

In the **Textbox Editor** window, the user can modify the text, text font, text size, background color, border size and border color. To edit a textbox, simply right-click on the desired textbox and select **Edit Textbox** from the popup menu that appears. The user can also delete a textbox by right-clicking and choosing **Delete Textbox**, or copy a textbox to the clipboard by right-clicking and selecting **Copy** (textboxes on layouts only).



Textbox Editor Window

13.27 Callout Editor

The **Callout Editor** provides a window for modifying what information appears in a specific item callout.

To open the **Callout Editor** window, right-click on a callout and select **Edit Item Callout** from the menu that appears.

The **Callout Editor** window is shown below for a shelter:

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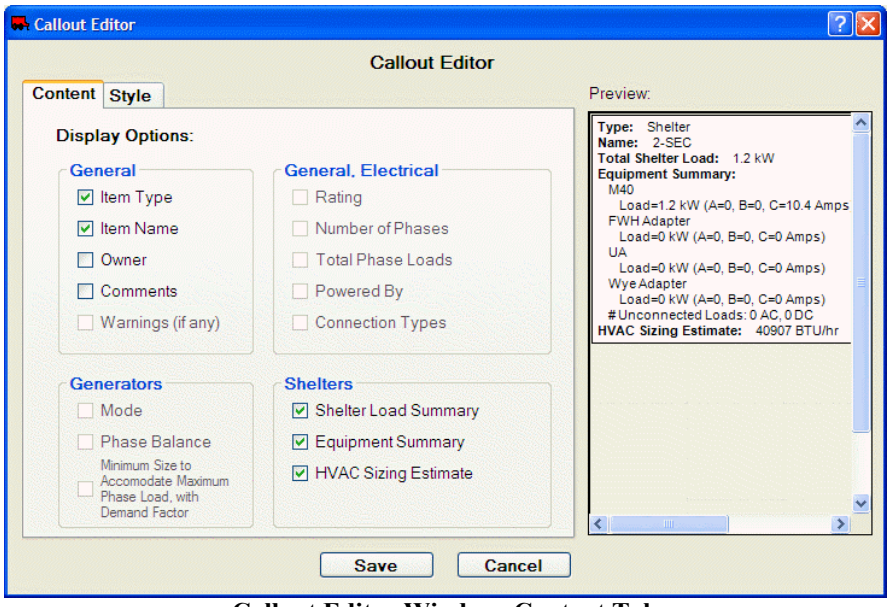
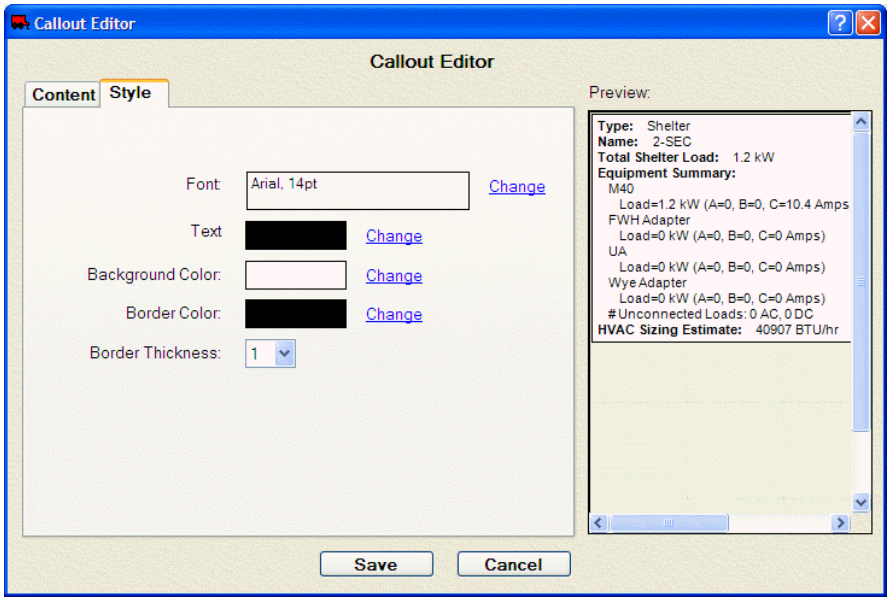


Callout Editor Window, Content Tab



Callout Editor Window, Style Tab

Content Tab

The **Content Tab** allows the user to select what information will appear on a callout. While all options are visible for all item types, options that do not apply to a specific item type are disabled. For example, in the images above, the options in the **General, Electrical** section are disabled since the callout here is for a shelter which has not electrical properties.

The options available vary slightly between AC item and DC items:

General

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- **Item Type**: Generator, shelter, consumer, distribution item, etc
- **Item Name**: The name of the item
- **Owner**: The person who "owns" this item *(for reference only...not utilized by AutoDISE)*
- **Comments**: Any miscellaneous comments made about this item
- **Warnings**: Any warnings about the item

General, Electrical

- **Rating (A)**: For AC items only, rating in Amps
- **Rated Power and DC Voltage**: For DC consumers and rectifiers only, rating in Watts and DC Voltage
- **Number of Phases**: The number of phases of the input connection
- **Total Phase Loads**: For non-DC rectifier and non-inverter items, summary of total loads on each phase
- **AC and DC Loads**: For DC rectifiers and inverters only, summary of AC and DC loads on rectifier
- **Powered By**: The generator powering this item, if any
- **Connection Types**: For distribution items only, a listing of connection types

Generators

- **Mode**: The current generator mode
- **Phase Balance**: The current balance percentage of generator phases.
- **Min. Size to Accommodate Maximum Phase Load, with Demand Factor:** Minimum 3-phase generator size required to prevent any one phase from exceeding its rated amperage capacity.

Shelters

- **Shelter Load Summary**: A summary of loads in the shelter
- **Equipment Summary**: A summary of equipment in the shelter.

Transformers

- **Voltage Step:** The input and output voltages of the transformer

Style Tab

In this section the user can modify the font, text color, background color, border color and border thickness of the callout.

13.28 Add New Icon

The **Add New Icon** window permits a user to add new user-defined icons to the Toolbox.

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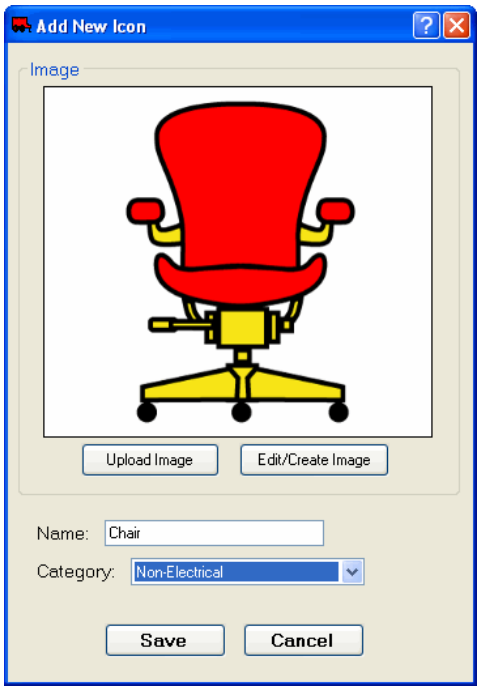

Add New Icon Window

The **Add New Icon** window may be accessed by clicking **Add New Icon** in the Icon Manager .

The user must complete all fields to save:

- **Image**: Click the **Upload Image** button to upload a new .gif, .jpg and .bmp image. Click the **Edit/Create Image** button to edit the uploaded image or create a new image using the Edit Icon Image window.
- **Name**: Enter the desired name of the item. Spaces are not allowed and all user-defined icons must have a unique name.
- **Category**: Select the desired category. For more information on categories, see Icon Manager.

13.29 Edit Icon

The **Edit Icon** window permits a user to edit user-defined icons in the Toolbox.

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Edit Icon Window

The **Edit Icon** window may be accessed by clicking the edit link (pencil image) next to desired icon in the Icon Manager.

Edit one or more of the following fields as desired:

- **Image**: Click the **Upload Image** button to upload a new .gif, .jpg and .bmp image. Click the **Edit/Create Image** button to edit the currently selected image using the Edit Icon Image window.
- **Name**: Modify the desired name of the item. Spaces are not allowed and all user-defined icons must have a unique name.
- **Category**: Select the desired category. For more information on categories, see Icon Manager.

13.30 Edit Icon Image

The **Edit Icon Image** window permits a user to perform basic image editing actions on an icon directly in AutoDISE.

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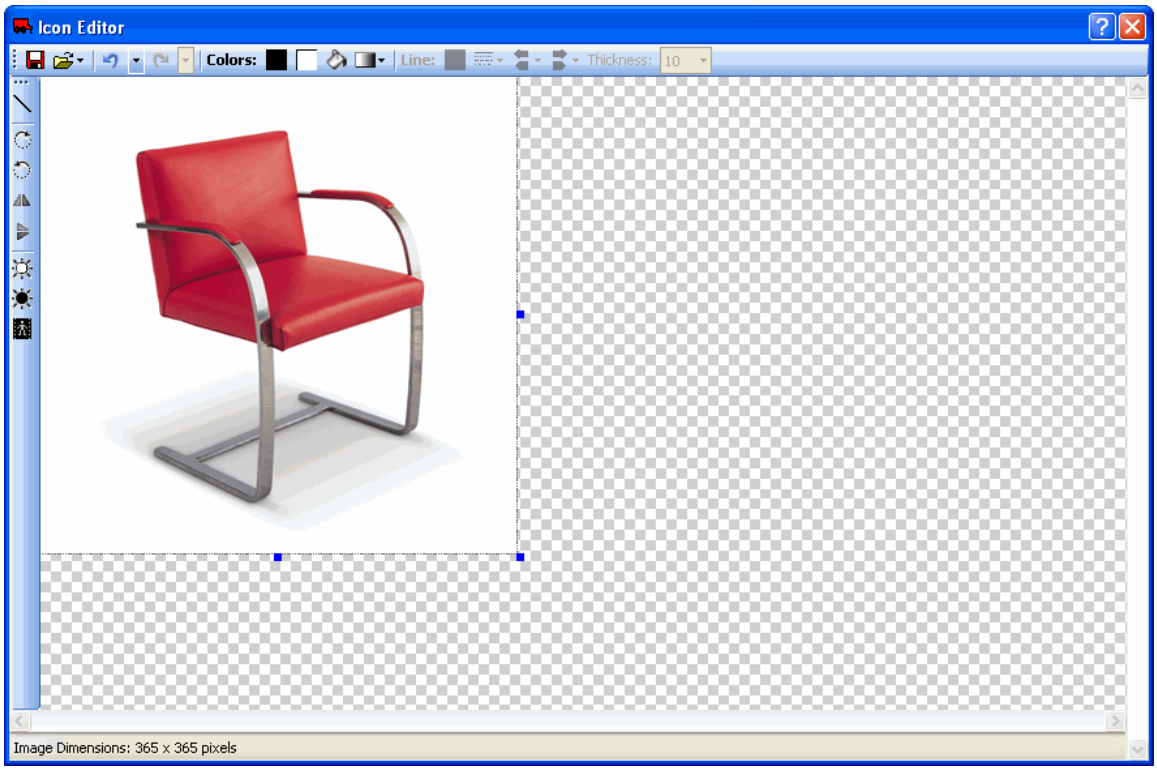

Edit Icon Image Window

The **Edit Icon Image** window may be accessed from a couple different locations:

1. Directly from a layout. Right-click on an item and select **Change/Edit Icon - Edit Icon** from the menu that appears.
2. From within the Icon Framework Editor. See Editing Icons in the Icon Framework Editor.
3. From the Icon Manager window. See Adding New Icons in the Icon Manager and Editing User-defined Icons in the Icon Manager.

The current features of the Icon Editor are limited to several basic tools:

- **Save**
- **Open Image from Icon Manager**
- **Open Image from File**
- **Colors: Primary, Secondary, Fill, Gradient**
- **Lines: Color, Dash Style, End Caps, Thickness**
- **Rotate Image**
- **Flip Image**
- **Brightness and Negativity**

Save

Click the **Save** button in the horizontal toolbar to save all changes made to the current image.

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***Note*: When an image is saved and the Icon Editor is closed, all lines become embedded in the image. Put another way, once you save and close an Icon Editor, any lines added to the image are permanently embedded in the image and may never be edited as independent objects again.**

Open Image from Icon Manager

To open an image from the Icon Manager, click the Open button on the horizontal toolbar and select **Open Image from Icon Manager**. Select an icon and click **Ok.**

Open Image from File

To open and image from file, click the Open button on the horizontal toolbar and select **Open Image from File**. Browse for the desired image and click **Open**..

Colors: Primary, Secondary, Fill, Gradient

The colors options appear on the horizontal toolbar, directly to the right of the Undo/Redo buttons:

Color Options on Horizontal Toolbar

The first button defines the "Primary" color, while the second button defines the "Secondary" color. The "Primary" color is the color used by the **Fill Tool** and the first color used by the **Gradient Tool** The "Secondary" color defines the second color used by the **Gradient Tool.** To change either color, click on the respective color button and select a color from the color palette that appears.

The **Fill Tool** completely fills the current image with the "Primary" color. Click the **Fill Tool** button to perform the fill.

The **Gradient Tool** completely fills the current image with the selected gradient pattern based on the "Primary" and "Secondary" colors. To view the available patterns, click the **Gradient Tool** button. Click a desired gradient pattern to apply.

Lines: Color, Dash Style, End Caps, Thickness

The Icon Editor provides the ability to add and edit lines with different colors, dash styles, end caps and thicknesses. The currently selected line options are shown in the horizontal toolbar, just to the right of the color options:

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Line Options on Horizontal Toolbar

To add a new line, click the **Add Line** button on the vertical toolbar. Click and drag on the image to add the new line. With the new line selected, you may now edit the line options by clicking on the **Change Line Color** button, the **Change Line Dash Style** button, the **Change Start Line Cap** button, the **Change End Line Cap** button and the **Change Line Thickness** button.

To edit an existing line, click on the desired line to select the line and set the line options as noted above.

To move a line, click and drag on the central portion of the line. To rotate the end point of a line, click and drag on the white end points of the line.

To delete a line, right-click on the line and select **Delete** from the menu that appears.

The **Embed Line in Image** option also appears when you right-click on a line. This option makes the selected line part of the actual image, rather than floating above it. This action means the user can no longer edit the line, but ensures that the line is now permanently affixed to the image when the image is resized.

Note: When an image is saved and the Icon Editor is closed, all lines become embedded in the image. Put another way, once you save and close an Icon Editor, any lines added to the image are permanently embedded in the image and may never be edited as independent objects again.

Rotate Image

The **Rotate Clockwise** and **Rotate Counter-Clockwise** buttons are located on the vertical toolbar and rotate the entire image by 90 degrees in the selected direction.

Rotate Image Buttons on Vertical Toolbar

Flip Image

The **Flip Horizontal** and **Flip Vertical** buttons are located on the vertical toolbar and flip the entire image in the desired direction.

Flip Image Buttons on Vertical Toolbar

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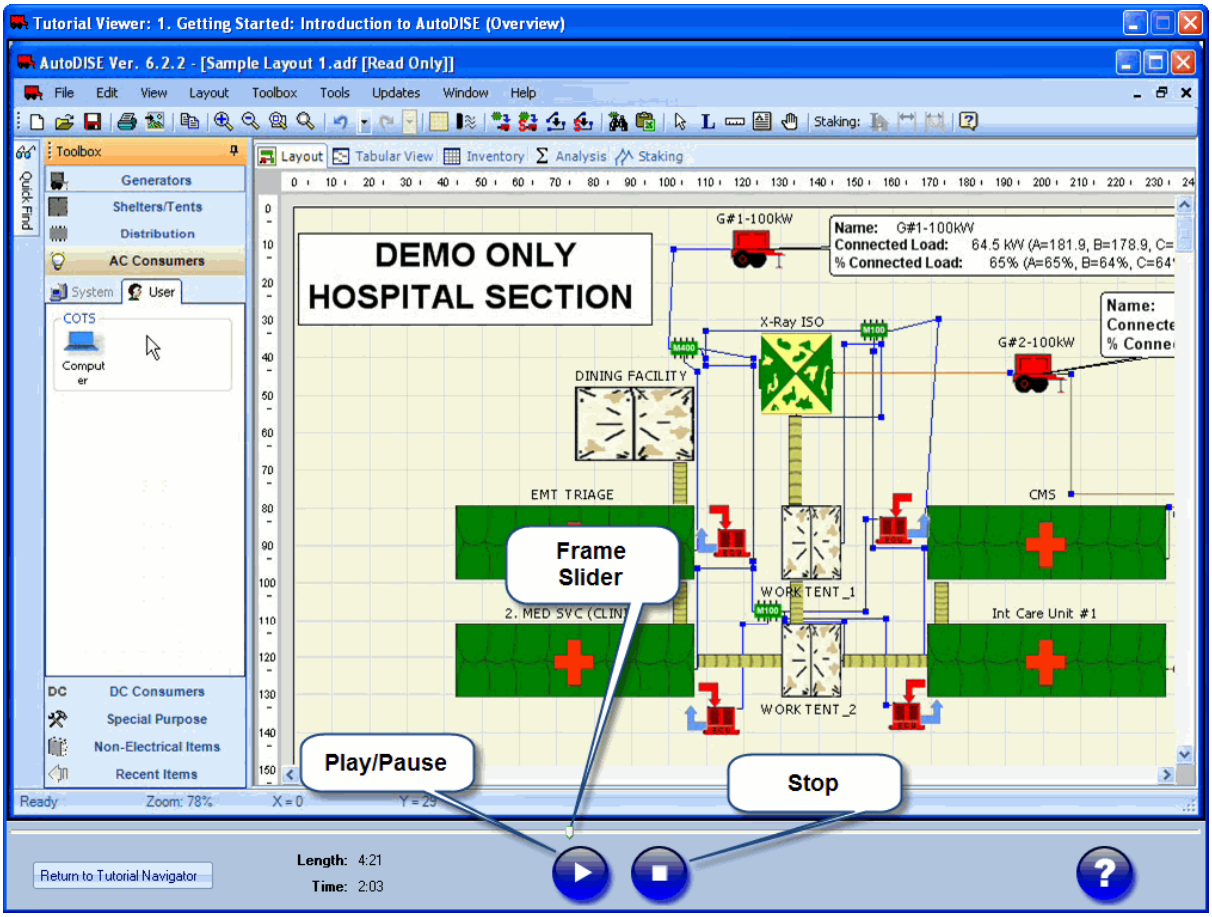
Brightness and Negativity

The **Brighten Image, Darken Image**, and **Negative Image** buttons are located on the vertical toolbar and serve to brighten, darken or take the negative of the entire image, respectfully.

Brightness and Negativity Buttons on Vertical Toolbar

13.31 Tutorial Viewer

The **Tutorial Viewer** window permits a user to view an AutoDISE Tutorial:



Tutorial Viewer Window

The **Tutorial Viewer** window can be opened in one of two ways:

- Open the **Help** menu, select **Tutorials,** then select a tutorial to view
- Open the **Help** menu, select **Tutorials,** select **Tutorial Navigator**, then select a tutorial

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to view

The title of the current tutorial in view is shown in the blue header bar of the window.

The following controls are located at the bottom of the window:

- **Return to Tutorial Navigator**: closes this window and opens the **Tutorial Navigator** window
- **Frame Slider**: drag this slider to move the current video frame in view to any location in the tutorial. Dragging the slider automatically pauses the tutorial, if playing.
- **Length**: The total duration, in minutes and seconds, of the current tutorial
- **Time**: The current time location in view in the tutorial
- **Play/Pause**: Plays or pauses the tutorial
- **Stop**: Stops the tutorial, which returns the tutorial to the beginning

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Part XIV

14 Menus and Toolbars

14.1 Main Menu

The **Main Menu** is horizontal, near the top of the AutoDISE window and contains nine menus:

- File Menu
- Edit Menu
- View Menu
- Layout Menu
- Toolbox Menu
- Tools Menu
- Updates Menu
- Window Menu
- Help Menu

See individual menus for specific help.

14.1.1 File Menu

The **File Menu** lets you open new layouts, open existing layouts, save and close layouts, print and export layouts, and access recently opened or saved layouts.

The **File Menu** options are shown below:

New	Create a new blank layout. ***Note*: AutoDISE uses a Multiple Document Interface (MDI) format. This means that a user can have multiple layouts open at the same time as separate windows within AutoDISE.**
Open	Open an existing layout. The **Open Layout** window appears where a user can select an existing AutoDISE layout file (.adf) to open.
Close	Closes the currently active Layout. The user will be asked if a save is desired before actually completing the close action.
Save	Saves the layout for the currently active window. This replaces the previously saved version with the most recent version. If the new layout has not been named, the **Save Layout As** window appears to allow the user to name the layout prior to saving.
Save As	Opens the **Save Layout As** window where the user can save the layout in the current active window under a new name.

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Print Layout...	Opens the Print Layout window, wherein the user can select a specific area to print, as well as adjust page margins and orientation. A **Print Preview** option is also available prior to printing.
Print Inventory...	Opens the Print Inventory window, wherein the user can print layout inventory in a variety of ways, including the full inventory of the layout, an inventory of just items on the main layout, inventories of each shelter, and any custom inventories built in the Inventory View section.
Print Analysis...	Opens the Print Analysis window, wherein the user can print layout analysis in a variety of ways, including the Layout Power Summary, an analysis of unpowered loads, and Generator Load Summary for each generator. These options correlate directly with the information available in the Analysis View section.
Export Layout to Image...	Opens the Export Layout to Image window, wherein the user can select an area of the layout to export, select image size, and select image file type. A preview option is also available. After export is complete, the exported image will automatically be opened in the default viewer for the specified image file type as registered in Windows.
Export Inventory...	Opens the Export Inventory window, wherein the user can export inventory information to Microsoft Word, Microsoft Excel or Adobe Acrobat. The types of inventory information available for export are identical to those discussed in the Print Inventory section above.
Export Analysis...	Opens the Export Analysis window, wherein the user can export analysis information to Microsoft Word, Microsoft Excel or Adobe Acrobat. The types of analysis information available for export are identical to those discussed in the Print Analysis section above.
Recently Accessed Layouts	The four most recent accessed layouts are listed in order. A user can simply click on a layout to open it.
Exit	Click to exit the program. The user will be asked whether each open layout needs to be saved prior to closing.

File Menu Options

14.1.2 Edit Menu

The **Edit Menu** contains editing commands for manipulation of items on layouts.

The **Edit Menu** options are shown below:

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Copy	This function will copy to the AutoDISE clipboard all selected (highlighted) items on the current layout. Once the items are copied, the user can right-click anywhere on the current layout and paste the selected items. ***Note**: When a shelter is copied, all items inside that shelter, including all links between those items, will be copied also, **except for links between paralleled generators and distribution items and the communication links between paralleled generators.***
Paste	Displays a prompt instructing the user to right-click on the current layout and choose **Paste** in order to paste an item from the clipboard.
Remove	The selected item(s) on the layout will be permanently deleted from the current layout along with any links that are attached to the selected item(s).
Select All	Will select (highlight) all items on the current layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon. ***Note: The user may NOT select items on two different layouts (main or shelter) at the same time.***
Select Inverse	Will select all items in the current layout that are not currently selected while simultaneously unselecting those that are. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Deselect All	Will unselect all items on all layouts.

Edit Menu Options

14.1.3 View Menu

The **View Menu** lets you control the way the user views the current layout information, as well as whether layout grid lines are drawn, whether link vertices are drawn and the zoom of the layout.

The **View Menu** options are shown below:

Layout View, Tabular View, Inventory, Analysis and Staking	Selecting one of these options is equivalent to clicking on the respective tab in the main window.

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Show Grid	The current layout can be displayed with or without horizontal and vertical grid lines. If **Show Grid** is checked, grid lines are visible; otherwise they are not. Select option to check or uncheck this feature. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Show Link Vertices	**Link Vertices** are small square boxes that define movable "elbows" on the links. Displaying link vertices on the layouts is optional. If **Show Link Vertices** is checked, vertices are visible; otherwise they are not. Select option to check or uncheck this feature. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Zoom	The user can zoom in and out of the current layout to various degrees from 35% to 200%. Zoom also has the ability to custom zoom to a user specified size. This is an option to Zoom Mode.

View Menu Options

14.1.4 Layout Menu

The **Layout Menu** provides options that are specific to any one layout.

The **Layout Menu** options are shown below:

Layout Properties	Opens the Layout Properties window allowing the user to edit properties related to current layout size, background color, vertex size, scales, link thickness, etc
View Items	Opens the Layout Item Properties window allowing the user to view properties of individual items on the current layout
Add Items from Toolbox	Opens the Add Items from Toolbox window allowing the user to add new items to the current layout from the Toolbox using a filter and query tool

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Add Multiple Consumers by Tabular Format	Opens the Add Multiple Consumers by Tabular Format window allowing a user to add multiple consumers at once to a layout by either copying and pasting from a Microsoft Excel file, using a Toolbox filter and query tool, or by hand entering information.
Default Layout Properties	Opens the Default Layout Properties window allowing a user to edit layout property defaults

Layout Menu Options

14.1.5 Toolbox Menu

The **Toolbox Menu** provides options for viewing, adding and editing equipment in the Toolbox.

The **Toolbox Menu** options are shown below:

View Toolbox Items	Opens Toolbox Item Properties window allowing a user to view properties of any item in the Toolbox
View Toolbox Cables	Opens the Cable Properties window allowing a user to view properties of any cable in the Toolbox.
Add New Item to Toolbox	Selecting this option opens a sub-menu, whereby the user can select precisely what type of item they wish to add to the Toolbox and opens the appropriate window for that item: Generator, Distribution Item (DISE, Breaker Panel or Receptacle), Consumer, DC Rectifier, Inverter, Transformer, Shelter or Non-electrical Item. See also: Adding New Equipment to Toolbox
Edit User-Defined Toolbox Items	Opens Toolbox Item Properties window allowing a user to view properties of any item in the Toolbox, defaulting the view in this window to filter out all but user-defined items
Add New Cable to Toolbox	Opens the Cable Properties window in add mode allowing a user to add a new user-defined cable to the Toolbox.
Import Toolbox Items From Another Computer	Opens the Import Toolbox Items From Another Computer window

ToolBox Menu Options

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14.1.6 Tools Menu

The **Tools Menu** contains options for tasks such as creating and routing links, balancing loads, locking links and others.

The **Tools Menu** options are shown below:

AutoConnect	Opens the AutoConnect Main Layout, or AutoConnect Shelter Equipment window, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
AutoConnect Selected	Opens the AutoConnect Main Layout, or AutoConnect Shelter Equipment window, with the **Only selected items** option selected, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Disconnect	Disconnects all items on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Disconnect Selected	Disconnects selected items on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
AutoRoute	AutoRoutes all links on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout.. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.

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AutoRoute Selected	AutoRoutes selected links on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout.. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon
Lock Links	Locks all links between all items on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Lock Links Between Selected Items	Locks all links between selected items on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Unlock Links	Unlocks all links between all items on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Unlock Links Between Selected Items	Unlocks all links between selected items on the main layout or shelter layout, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Balance All Generators	For all three-phase generators, electrical consumers will be rearranged within their respective distribution item to give optimum balance across each phase of the parent generator. See Phase Balancing

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Balance Selected Generators	For selected three-phase generators, electrical consumers will be rearranged within their respective distribution item to give optimum balance across each phase of the parent generator. See Phase Balancing
Highlight Unconnected Items	Selects all items on the main layout that are unconnected, depending on the selection. If no sub-menu options appear, the action will take place on the main layout. If at least one shelter layout is open, sub-menu options will appear. In this case, the user must select which layout to act upon.
Options	Opens the Options window allowing the user to modify overall AutoDISE program settings
Icon Manager	Opens the Icon Manager window allowing the user to add, edit and delete icon images from the Toolbox.
Icon Framework Manager	Opens the Icon Framework Manager window allowing the user to add/edit/delete user-defined Icon Frameworks and view system-defined frameworks
Passageway Manager	Opens the Passageway Manager window allowing the user to add/edit/delete user-defined passageways and view system-defined passageways.
HVAC Requirements Calculator	Opens the HVAC Requirements Calculator window.

Tools Menu Options

14.1.7 Updates menu

The **Updates Menu** provides options for running program updates.

The **Updates Menu** options are shown below:

Automatic Program Updates	AutoDISE will communicate with the AutoDISE Web Site to see if any updates are available. If so, AutoDISE will prompt the user if they wish to run the available update. ***Note: If the "Automatically check for updates on program startup" is selected in the Options window, this automatic update feature will run every time AutoDISE is started up.*** ***Note: This option is disabled when running AutoDISE off of a CD-ROM***

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Manual Program Updates	Manual updates are an option, especially when running AutoDISE without Internet access. To run a manual program update in this situation, an update file must be copied onto the client machine via a removable media. Clicking this option opens the Manual Program Updates window. See the Manual Program Updates section for more information. ***Note: This option is disabled when running AutoDISE off of a CD-ROM***

Updates Menu Options

14.1.8 Window Menu

The **Windows Menu** provides options for arranging multiple layout windows.

The **Windows Menu** options are shown below:

Cascade	"Un-maximizes" all windows and arranges them in an overlapping fashion so all windows are visible
Tile Horizontally	"Un-maximizes" all windows and arranges them horizontally to fit inside the available area
Tile Vertically	"Un-maximizes" all windows and arranges them vertically to fit inside the available area
[Individual Layout Selection]	Each open layout has an entry. Click on the desired layout to bring it to the front.

Windows Menu Options

14.1.9 Help Menu

The **Help Menu** provides AutoDISE help information.

The **Help Menu** options are shown below:

AutoDISE Help	Opens the AutoDISE help program
User's Manual	Opens a printable, .pdf version of AutoDISE help
Technical Support	Opens a window with contact information for technical support
Tutorials	Provides links to AutoDISE Tuturials
Sample Layouts	Provides links to AutoDISE Sample Layouts

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About AutoDISE	Opens a window with background and version information about AutoDISE
New Version Changes	Displays most recent set of changes to the program

Help Menu Options

14.2 Toolbars

14.2.1 Main Toolbar

The **Main Toolbar** contains buttons to make use of AutoDISE smoother and easier. Similar to most Windows applications, some of the toolbar buttons are simply shortcut means to access menu item options. However, the toolbar does contain some features that are NOT available on the menu.

Main Toolbar

The **Main Toolbar** options are shown below:

	New Layout	Create a new blank layout. ***Note: AutoDISE uses a Multiple Document Interface (MDI) format. This means that a user can have multiple layouts open at the same time as separate windows within AutoDISE.***
	Open Layout	Open an existing layout. The **Open Layout** window appears where a user can select an existing AutoDISE layout file (.adf) to open.
	Save Layout	Saves the layout for the currently active window. This replaces the previously saved version with the most recent version. If the new layout has not been named, the **Save Layout As** window appears to allow the user to name the layout prior to saving.
	Print Layout	Opens the Print Layout window, wherein the user can select a specific area to print, as well as adjust page margins and orientation. A **Print Preview** option is also available prior to printing.
	Export Layout to image	Opens the Export Layout to Image window, wherein the user can select an area of the layout to export, select image size, and select image file type. A preview option is also available. After export is complete, the exported image will automatically be opened in the default viewer for the specified image file type as registered in Windows.

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	Copy	This function will copy to the AutoDISE clipboard all selected (highlighted) items on the layout. Once the items are copied, the user can right-click anywhere on the layout and paste the selected items. ***Note**: When a shelter is copied, all items inside that shelter, including all links between those items, will be copied also, **except for links between paralleled generators and distribution items and the communication links between paralleled generators.***
	Zoom In	Switches to zoom in mode so the user may zoom in on a layout. See Setting Zoom for the Main Layout and Setting Zoom for a Shelter Window
	Zoom Out	Switches to zoom out mode so the user may zoom out on a layout. See Setting Zoom for the Main Layout and Setting Zoom for a Shelter Window
	Zoom In on Selected Area	Switches to zoom area mode so the user may drag and select an area to zoom in on. See Setting Zoom for the Main Layout and Setting Zoom for a Shelter Window
	Zoom to Fit Page	Automatically zooms in or out of main layout view so that all items in layout are visible. See Setting Zoom for the Main Layout and Setting Zoom for a Shelter Window
	Undo	Performs undo on the most recent action. Select on drop down immediately adjacent to this button to undo multiple actions at once.
	Redo	Performs redo on the most recent action. Select on drop down immediately adjacent to this button to redo multiple actions at once.
	Layout Properties	Opens the Layout Properties window allowing the user to edit properties related to layout size, background color, vertex size, scales, link thickness, etc
	AutoConnect	Opens the AutoConnect Main Layout window

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	AutoConnect Selected	Opens the AutoConnect Main Layout window with the **Only selected items** checkbox checked
	Auto-Route	AutoRoutes all links on the main layout
	Auto-Route Selected	AutoRoutes all links between selected items on the main layout
	Add Items from Toolbox	Opens the Add Items from Toolbox window allowing the user to add new items to the layout from the Toolbox using a filter and query tool
	Add Multiple Consumers by Tabular Format	Opens the Add Multiple Consumers by Tabular Format window allowing a user to add multiple consumers at once to a layout by either copying and pasting from a Microsoft Excel file, using a Toolbox filter and query tool, or by hand entering information.
	Normal Mode	Resets AutoDISE to Normal Mode
	Link Mode	Activates Link Mode
	Ruler Mode	Activates Ruler Mode
	Textbox Mode	Activates Textbox Mode
	Drag Layout Mode	Activates Drag Layout Mode
	Staking Link Mode	Activates Staking Link Mode
	Staking Dimensions Mode	Activates Staking Dimensions Mode
	Staking View Options	Opens the Staking View Options window, allowing the user to modify what information is displayed in the Staking View.
	Help	Opens the AutoDISE help program

Main Toolbar Options

14.2.2 Shelter Window Toolbar

The **Shelter Window Toolbar** exists within the shelter window and contains buttons to make use of AutoDISE inside shelters smoother and easier.

The buttons on **Shelter Window Toolbar** are very much like the buttons on the **Main Toolbar**, with a couple exceptions.

Shelter Window Toolbar

The **Shelter Window Toolbar** options are shown below:

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	Print Layout	Opens the Print Layout window, which defaults to showing the layout of the shelter, wherein the user can select a specific area to print, as well as adjust page margins and orientation. A **Print Preview** option is also available prior to printing.
	Export Layout to image	Opens the Export Layout to Image window, which defaults to showing the layout of the shelter, wherein the user can select an area of the layout to export, select image size, and select image file type. A preview option is also available. After export is complete, the exported image will automatically be opened in the default viewer for the specified image file type as registered in Windows.
	Background Image Opacity	Clicking on this button opens a slider which the user can drag left and right to adjust the opacity of the background image of the shelter
	Zoom to Fit Layout to Window	Automatically zooms in or out of shelter layout to fit the layout perfectly within the viewable area of the shelter window
	AutoConnect	Opens the AutoConnect Shelter Equipment window
	AutoConnect Selected	Opens the AutoConnect Shelter Equipment window with the **Only selected items** checkbox checked
	Auto-Route	AutoRoutes all links on the shelter layout
	Auto-Route Selected	AutoRoutes all links between selected items on the shelter layout
	Add Multiple Consumers by Tabular Format	Opens the Add Multiple Consumers by Tabular Format window allowing a user to add multiple consumers at once to the shelter layout by either copying and pasting from a Microsoft Excel file, using a Toolbox filter and query tool, or by hand entering information.

Shelter Window Toolbar Options

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Part XV

15 Appendices

15.1 Hourly Fuel Consumption

Hourly Fuel Consumption

Fuel consumption is calculated as a function of percent load and fuel type. The load divided by the generator power rating is the percent load.
The performance curves are set in the performance tab in the properties menu of the generator. The performance curve is defined by the 4th order polynomial below.

$$y = c1*x4 + c2*x3 + c3*x2 + c4*x + c5$$

where y is the fuel consumption rate in gallons / Hr, x is the percent load, and c1-c5 are editable constants that determine the shape of the curve.

Because performance curves of diesel generators vary, the user is able to set or adjust the variable constants of each generators polynomial to model the desired generator performance. This curve fitting process can be determined mathematically from experimental data of the generator using a curve fitting process like EXCEL uses.

The performance curves for the 3 kW, 5 kW, 10kW, 15kW, 30kW, 60kW, 100kW and 200kW have been preset in the system toolbox using empirical data that was provided by Aberdeen Proving Ground with TQGs operating on Diesel-2 fuel. See the following Chart with the corresponding polynomial fits below. These polynomials represent a perfect fit (R-squared=1) of the experimental data points provided. For all other generators, linear polynomials are created by extrapolating the efficiency data based on the generator size.

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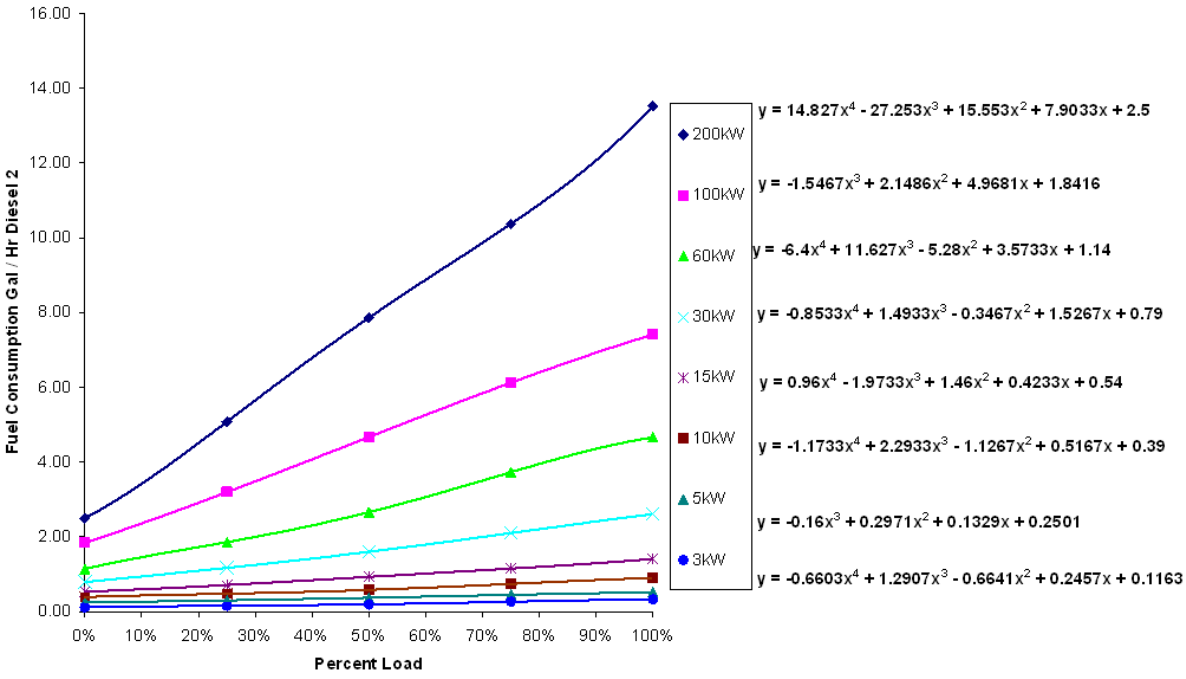

In AutoDISE the user can select from the following two types of fuel available during curve fitting. The user must specify which fuel type was used during the curve fit and which type of fuel is available for use in the field. The two types of fuel are JP-8 and Diesel 2. Below lists their respective Net Heat of Combustion or energy available by combusting a gallon of fuel.

LHV (Net Heat of Combustion)

* **Diesel 2** = 131,207 BTU/gal
* **JP-8** = 123,069 BTU/gal

* (Fuel User Guide published by TARDEC in 2000)

Diesel 2 produces 106.6% (131,207 / 123,069) more energy than JP-8 per gallon and thus the respective polynomial curve fitting constants of JP-8 are 106.6% times the value of the curve fitting constants of Diesel 2.

Fuel used by a generator can be calculated if one knows the generator operating load, the performance curve of the generator, and the length of time that it is operating at the given load. Summing the fuel used at each operating condition during the day will result in the daily fuel consumption of the generator. AutoDISE allows the user to select one of two approaches to calculate fuel consumption. It can be calculated using:

1. The demand factor approach.
2. The duty cycle binomial distribution approach

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The demand factor approach will be used to calculate fuel consumption if the Use Demand Load is checked in the Layout Properties menu under warnings. If the demand factor approach is selected then AutoDISE uses the demand load to determine the % load. It will use this % load and the fuel type to calculate fuel consumption directly from the performance curve of the specified generator.

If the Use Demand load in the layouts properties menu is not checked then AutoDISE will use the duty cycle binomial distribution approach to calculate fuel consumption. AutoDISE calculates the required generator power and demand load to operate at 10%-100% confidence at 10% intervals or 2.4 hrs. Again confidence refers to the percentage of time that the generator will supply sufficient power for the connected loads. The demand load is the maximum active load at each given confidence. From the percent load, the fuel type and the generator performance curve, the fuel consumption is calculated for each interval. Then AutoDISE sums the fuel consumption based on % load from each to compute daily fuel consumption.

Army stated that they preferred fuel consumption per hour. This is calculated by dividing the daily fuel consumption by 24 hrs. It should be noted though that duty cycle is the probability that an electrical load is active during the course of a day (not during a given hour).

15.2 AutoConnect Methodology

AutoConnect Methodology

The methodology for AutoConnect is depicted below using a flowchart. Two sections, connecting single phase loads and connecting 3-phase loads are further detailed in subsequent flowcharts.

Note: Since version 6.1, AutoDISE permits variable phase-to-neutral voltages for all items. AutoConnect, therefore, runs the methodology below ONCE FOR EVERY VOLTAGE REPRESENTED ON A LAYOUT, not including transformers. For example, if there is at least one 120V generator and at least one 240V consumer on a layout, AutoDISE will run AutoConnect twice: once for 120V, once for 240V. AutoConnect will NEVER connect items of mismatched voltages.

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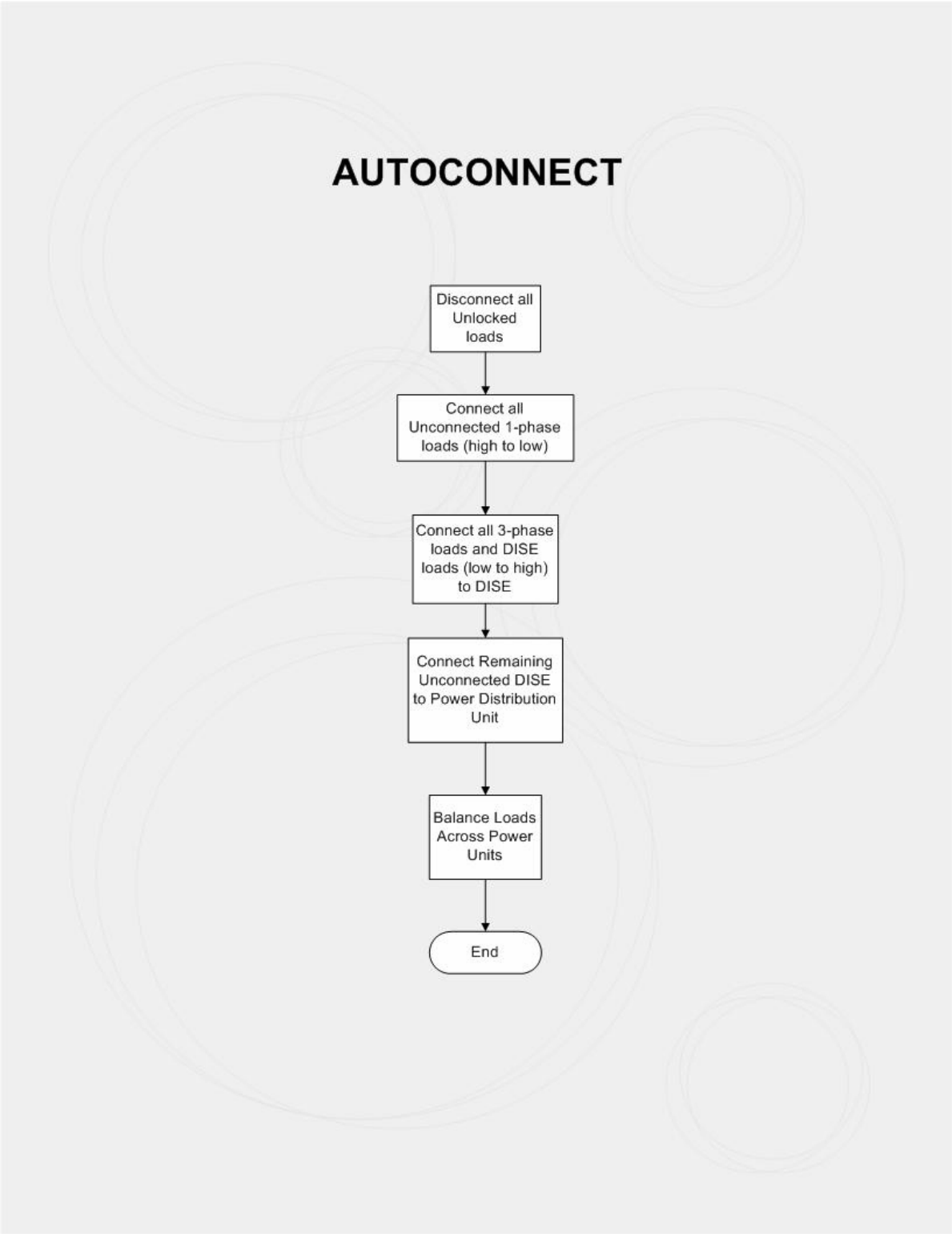
AUTOCONNECT
Disconnect all Unlocked loads
Connect all Unconnected 1-phase loads (high to low)
Connect all 3-phase loads and DISE loads (low to high) to DISE
Connect Remaining Unconnected DISE to Power Distribution Unit
Balance Loads Across Power Units
End

Overall Logic Flow of AutoConnect

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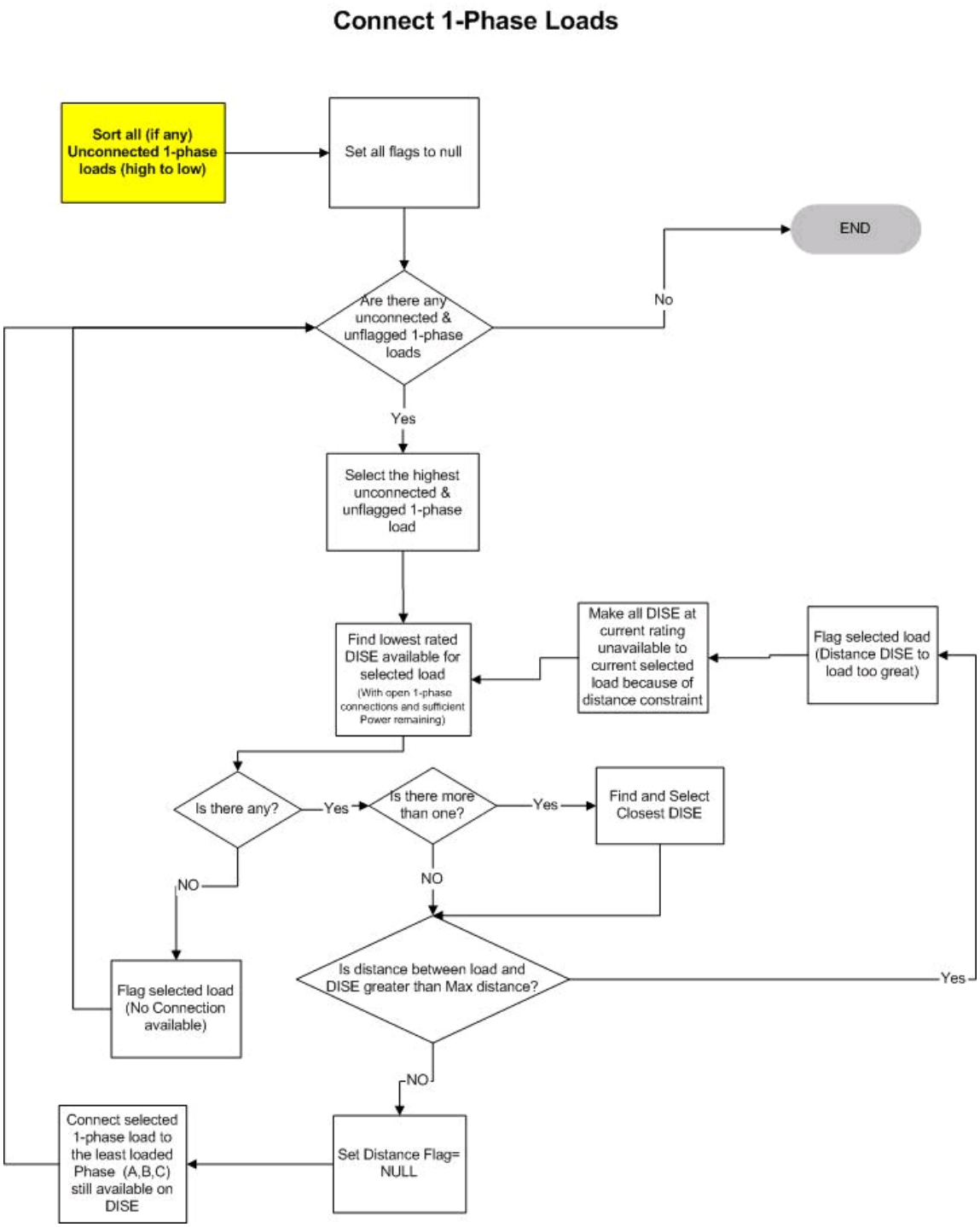
Connect 1-Phase Loads
Sort all (if any) Unconnected 1-phase loads (high to low)
Set all flags to null
END
Are there any unconnected & unflagged 1-phase loads
No
Yes
Select the highest unconnected & unflagged 1-phase load
Find lowest rated DISE available for selected load
(With open 1-phase connections and sufficient Power remaining)
Make all DISE at current rating unavailable to current selected load because of distance constraint
Flag selected load (Distance DISE to load too great)
Is there any?
Yes
Is there more than one?
Yes
Find and Select Closest DISE
NO
NO
Is distance between load and DISE greater than Max distance?
Yes
Flag selected load (No Connection available)
NO
Connect selected 1-phase load to the least loaded Phase (A,B,C) still available on DISE
Set Distance Flag= NULL

Logic Flow for Connecting Single Phase Loads

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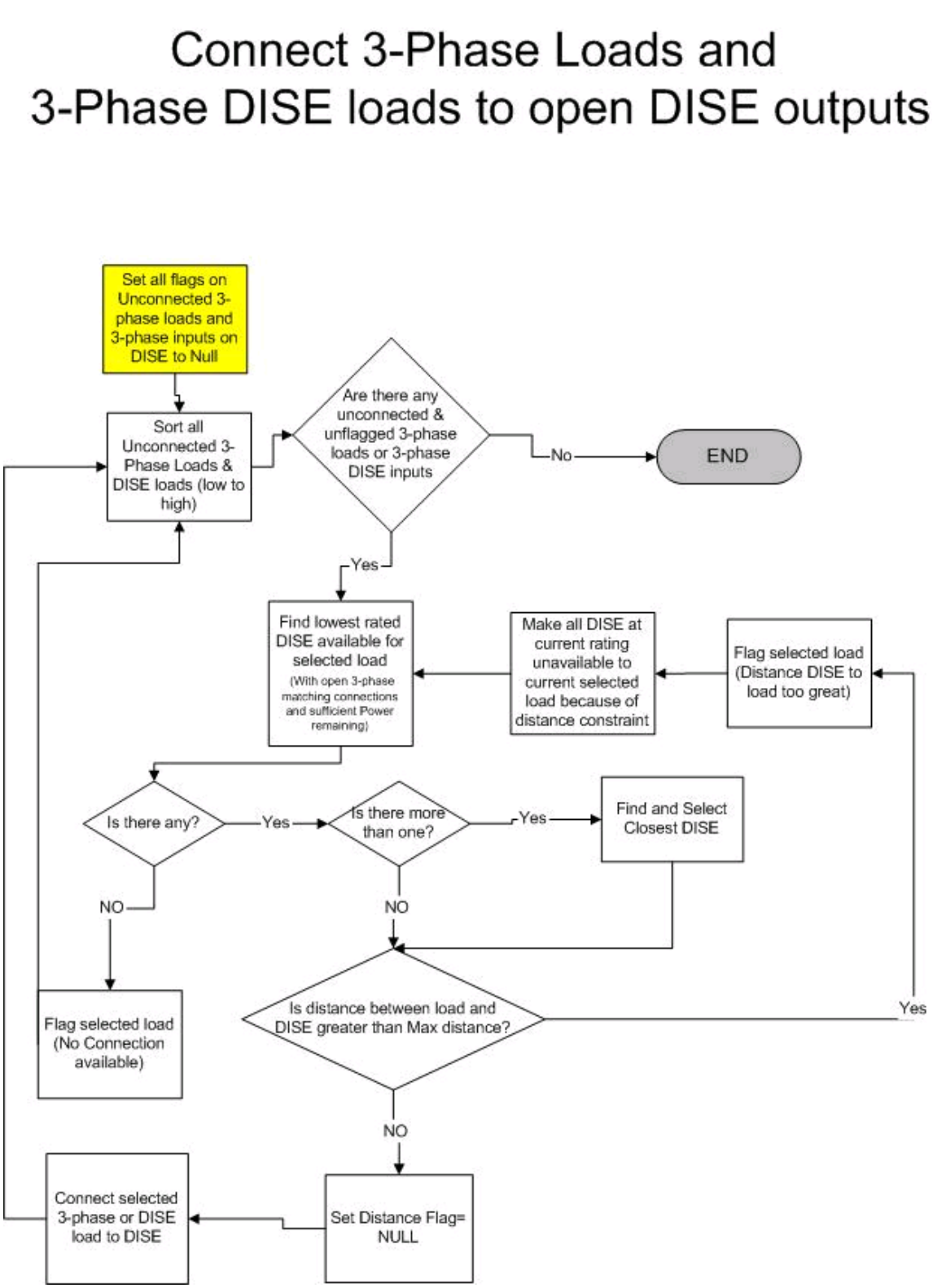
Connect 3-Phase Loads and
3-Phase DISE loads to open DISE outputs
Set all flags on Unconnected 3-phase loads and 3-phase inputs on DISE to Null
Sort all Unconnected 3-Phase Loads & DISE loads (low to high)
Are there any unconnected & unflagged 3-phase loads or 3-phase DISE inputs
No
END
Yes
Find lowest rated DISE available for selected load
(With open 3-phase matching connections and sufficient Power remaining)
Make all DISE at current rating unavailable to current selected load because of distance constraint
Flag selected load (Distance DISE to load too great)
Is there any?
Yes
Is there more than one?
Yes
Find and Select Closest DISE
NO
NO
Flag selected load (No Connection available)
Is distance between load and DISE greater than Max distance?
Yes
NO
Connect selected 3-phase or DISE load to DISE
Set Distance Flag= NULL

Logic Flow for Connecting Three Phase Loads

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15.3 Methodology Used for Calculating Suggested Cable Lengths

The methodology used for calculating suggested cable lengths is described below:

- Overall flowchart
    1. Initialize connector types and properties of link
    2. Add necessary extensions and adapters
    3. Calculate suggested cables given specified inventory
    4. Recommended final cable based on properties of remaining link
- USMC and Army guidelines for USMC field wiring harness (FWH), Army M46, and USMC pre-wired receptacle outlets
- For using suggested cables to calculate voltage drops, if cable gauge is not specified...

Overall flowchart

Below is the overall flowchart for calculating suggested cable lengths from a given link length. Detail on each area is provided afterwards.

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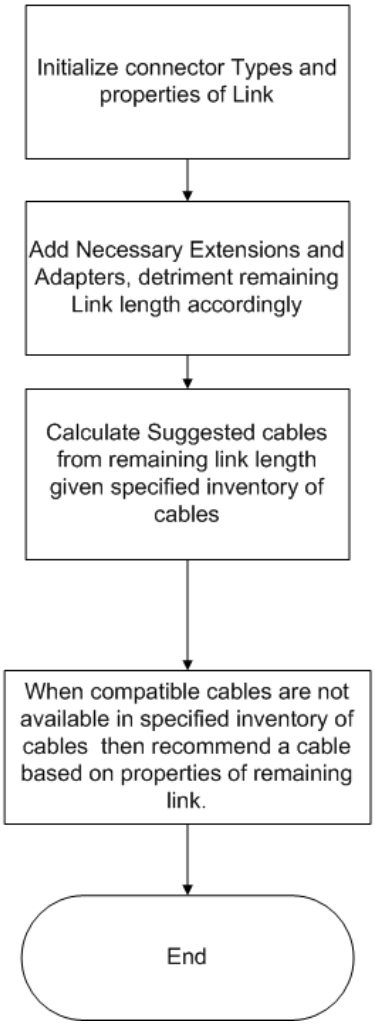
Create Suggested Cables Given Link Length


Initialize connector Types and properties of Link
Add Necessary Extensions and Adapters, detriment remaining Link length accordingly
Calculate Suggested cables from remaining link length given specified inventory of cables
When compatible cables are not available in specified inventory of cables then recommend a cable based on properties of remaining link.
End

1. Initialize connector types and properties of link

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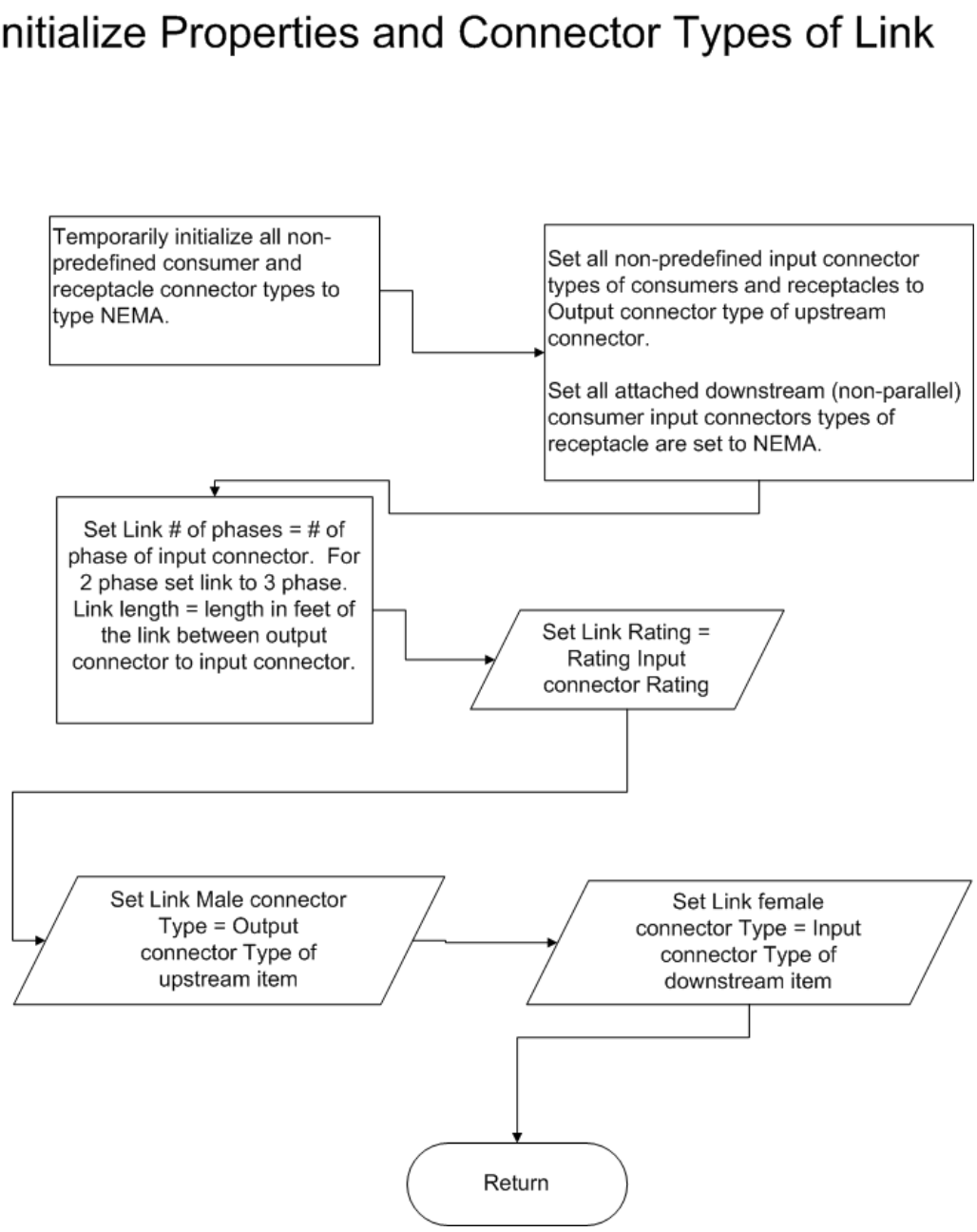
Initialize Properties and Connector Types of Link
Temporarily initialize all non-predefined consumer and receptacle connector types to type NEMA.
Set all non-predefined input connector types of consumers and receptacles to Output connector type of upstream connector.
Set all attached downstream (non-parallel) consumer input connectors types of receptacle are set to NEMA.
Set Link # of phases = # of phase of input connector. For 2 phase set link to 3 phase. Link length = length in feet of the link between output connector to input connector.
Set Link Rating = Rating Input connector Rating
Set Link Male connector Type = Output connector Type of upstream item
Set Link female connector Type = Input connector Type of downstream item
Return

2. Add necessary extensions and adapters

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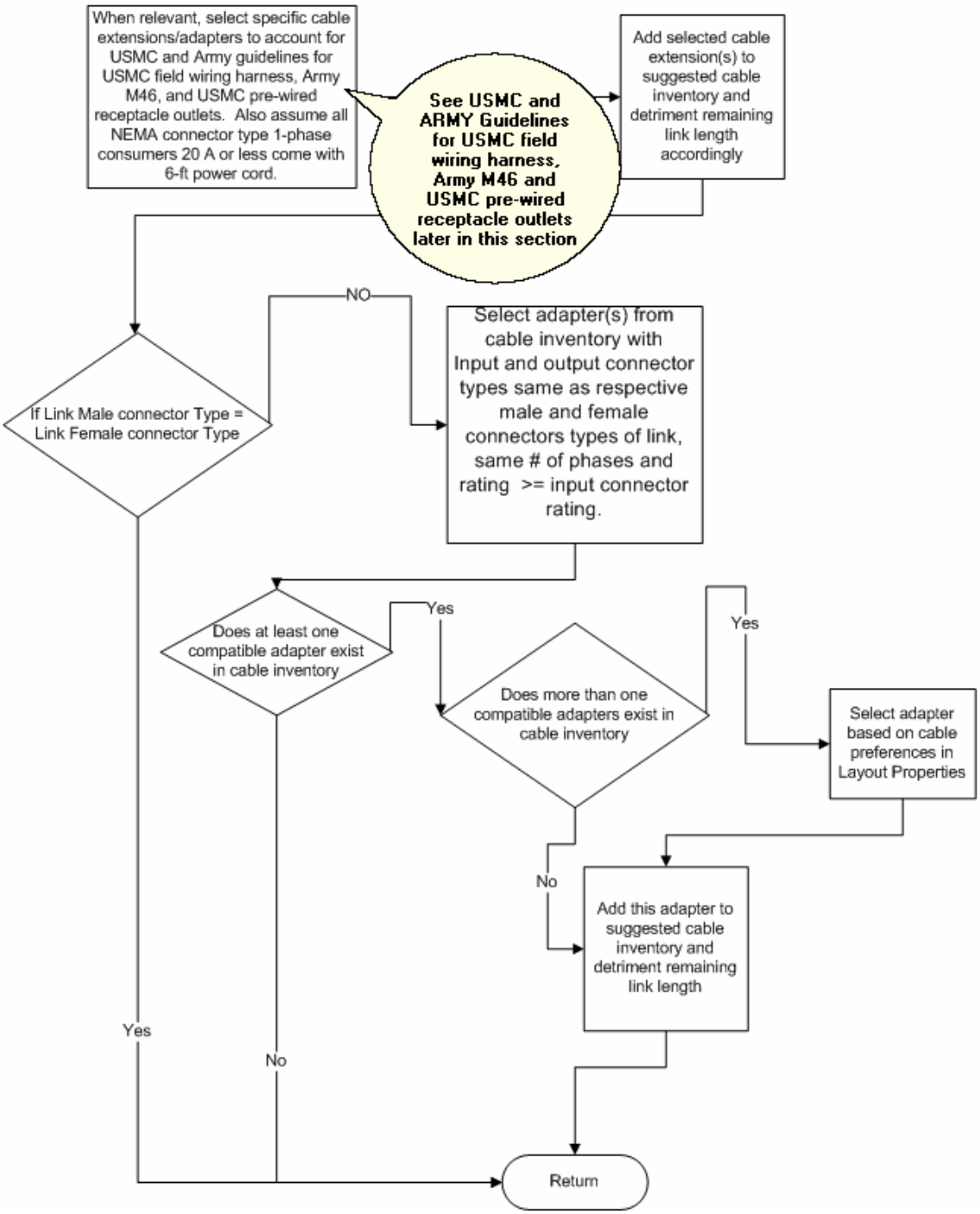
Suggesting cable Extensions and Adapters


When relevant, select specific cable extensions/adapters to account for USMC and Army guidelines for USMC field wiring harness, Army M46, and USMC pre-wired receptacle outlets. Also assume all NEMA connector type 1-phase consumers 20 A or less come with 6-ft power cord.
See USMC and ARMY Guidelines for USMC field wiring harness, Army M46 and USMC pre-wired receptacle outlets later in this section
Add selected cable extension(s) to suggested cable inventory and detriment remaining link length accordingly
If Link Male connector Type = Link Female connector Type
NO
Select adapter(s) from cable inventory with Input and output connector types same as respective male and female connectors types of link, same # of phases and rating >= input connector rating.
Does at least one compatible adapter exist in cable inventory
Yes
Does more than one compatible adapters exist in cable inventory
Yes
Select adapter based on cable preferences in Layout Properties
No
Add this adapter to suggested cable inventory and detriment remaining link length
Yes
No
Return

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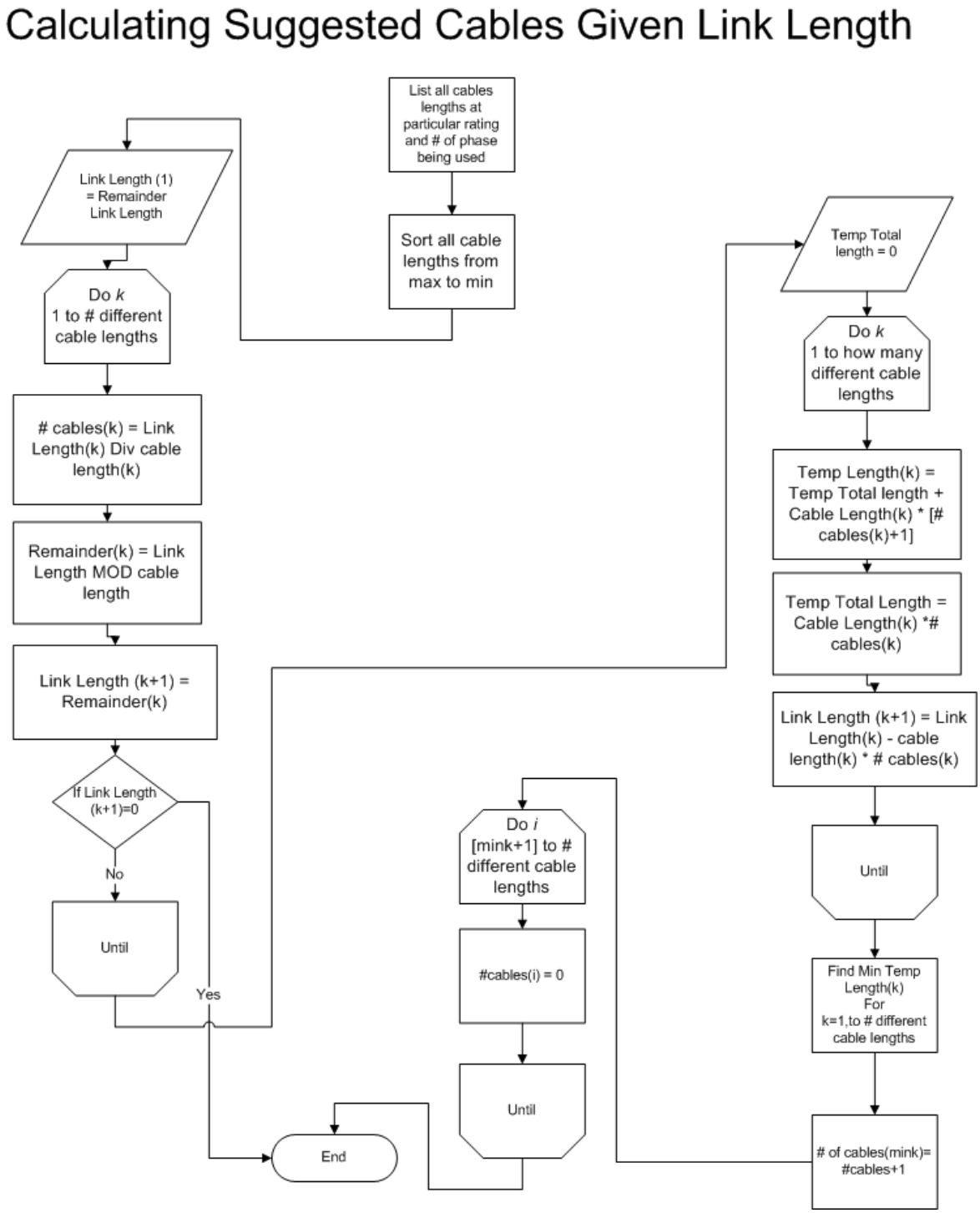
3. Calculate suggested cables given specified inventory


Calculating Suggested Cables Given Link Length
List all cables lengths at particular rating and # of phase being used
Sort all cable lengths from max to min
Link Length (1) = Remainder Link Length
Do k 1 to # different cable lengths
cables(k) = Link Length(k) Div cable length(k)
Remainder(k) = Link Length MOD cable length
Link Length (k+1) = Remainder(k)
If Link Length (k+1)=0
No
Until
Yes
End
Temp Total length = 0
Do k 1 to how many different cable lengths
Temp Length(k) = Temp Total length + Cable Length(k) * [# cables(k)+1]
Temp Total Length = Cable Length(k) *# cables(k)
Link Length (k+1) = Link Length(k) - cable length(k) * # cables(k)
Until
Find Min Temp Length(k) For k=1,to # different cable lengths
# of cables(mink)= #cables+1
Do i [mink+1] to # different cable lengths
#cables(i) = 0
Until

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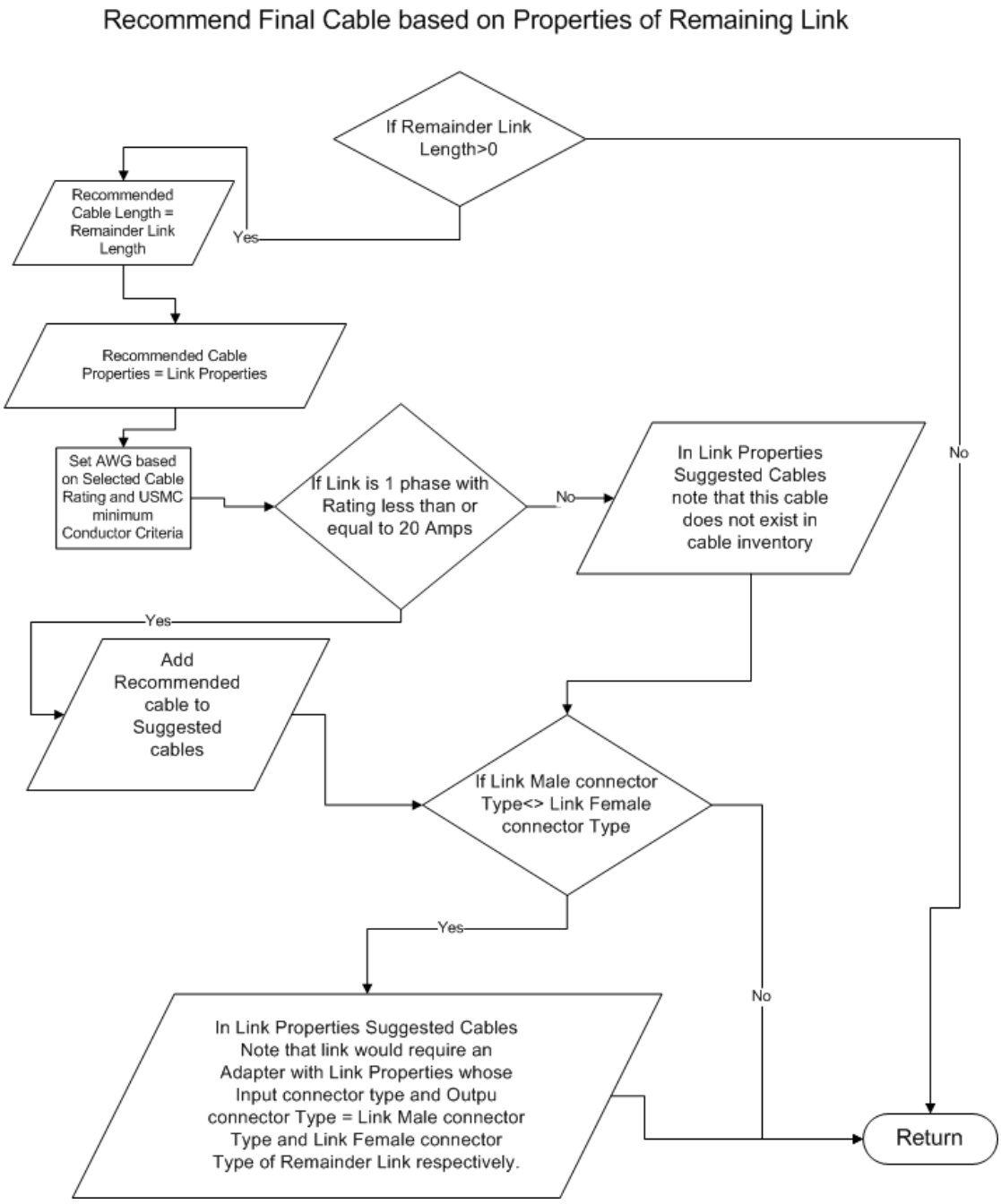
4. Recommended final cable based on properties of remaining link


Recommend Final Cable based on Properties of Remaining Link
If Remainder Link Length>0
Yes
No
Recommended Cable Length = Remainder Link Length
Recommended Cable Properties = Link Properties
Set AWG based on Selected Cable Rating and USMC minimum Conductor Criteria
If Link is 1 phase with Rating less than or equal to 20 Amps
No
In Link Properties Suggested Cables note that this cable does not exist in cable inventory
Yes
Add Recommended cable to Suggested cables
If Link Male connector Type<> Link Female connector Type
Yes
No
In Link Properties Suggested Cables Note that link would require an Adapter with Link Properties whose Input connector type and Outpu connector Type = Link Male connector Type and Link Female connector Type of Remainder Link respectively.
Return

USMC and Army guidelines for USMC field wiring harness (FWH), Army M46, and USMC pre-wired receptacle outlets

See Step 2 above. During the selection of extension and adapters, AutoDISE attempts to follow guidelines used by the USMC and ARMY for determining cables required for links

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which represent USMC field wiring harnesses (FWH), the ARMY M46 and USMC pre-wired receptacle outlets.

The following guidelines are followed:

1. Assume all NEMA 5-15 connector types for 1-phase consumers, 20 A or less, come with 6-ft power cord, 10 AWG. Don't include power cord in inventory, but show in link properties, suggested cables and include in voltage drop calculations.

2. Assume all receptacles connected to NEMA 5-15 outputs have 50 ft extension cords with 10 AWG. Include in inventory. (Assumption from MEPDIS-R pre-wired receptacle outlets)

3. Assume all receptacles connected to IEC-309 outputs have 50 ft extension cords with 10 AWG. Include in inventory. (Assumption from MEPDIS-R pre-wired receptacle outlets)

4. Assume all receptacles inputs type MILSPEC have 8ft extensions 12 AWG. Include in inventory. (Assumption from FWH and M46 guidelines)

5. Assume for FWH that a 25 ft extension will replace 3 x 8 ft extensions even though 3x24 ft is shorter.

6. Assume all receptacles inputs type MILSPEC (includes Wye and FWH adapters) connected to USMC MILSPEC outputs also contain a 15ft FWH lead-in extension, 12 AWG, at start of link. Include in inventory. (Assumption from FWH)

7. Assume all receptacles inputs type MILSPEC (includes Wye and FWH adapters) connected to pigtail outputs also contain a 20ft FWH generator lead-in extension, 12 AWG, at start of link. Include in inventory. (Assumption from FWH)

8. Assume all receptacles inputs type MILSPEC (includes Wye and FWH adapters) connected to NEMA outputs also contain a 4ft FWH commercial power jumper lead-in extension, 12 AWG, at start of link. Include in inventory. (Assumption from FWH)

9. Assume all FWH Light Segment consumers have a 6 ft FWH Switch directly upstream as long as upstream item is not also a consumer. Include in inventory. (Assumption from FWH)

10. For FWH light segment consumer chains, assume that the link between segments is a direct connection unless the link length is greater than 8 ft. Always include 8 ft FWH light segment in voltage drop equation using 12 gauge (AWG) cable. (Assumption from FWH)

For using suggested cables to calculate voltage drops, if cable gauge is not specified

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then:

1. Assume all cables requiring rating <= 20 Amps are set to 10 AWG.
2. Assume all cables requiring rating > 60 and <=100 Amps are set to 4 AWG.
3. Assume all cables requiring rating > 100 and <=200 Amps are set to 2/0 AWG.
4. Assume all cables requiring rating > 200 and <=400 Amps are set to 4/0 AWG.
5. If cables requiring rating > 400 set to 4/0 AWG (this might need to be revised in the future if larger distributions systems are added to inventory).
6. For small DC loads use 12 AWG cables (this might need to be revised in the future if large DC loads are added)

The above are based on USMC minimum cable conductor sizes for the MEPDIS-R

15.4 HVAC Requirements Calculator Algorithm

The HVAC Requirements Calculator is a dynamic tool designed to assist AutoDISE users with the calculation of the heating/cooling requirements of a particular shelter given a variety of internal and external shelter conditions. It is based to some extent on the procedures and algorithms detailed in the US Army CECOM Shelter System Assessment Model (SAM), built in May of 1990, and the 2005 Edition of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Fundamentals Handbook.. While the SAM model employs an exhaustive and complicated algorithm that requires a high number of detailed inputs to function (typically far more than any average soldier would be able to provide) AutoDISE greatly reduces inputs and calculations through a variety of assumptions and simplifications so that an average soldier in the field can utilize the program in a meaningful way.

The output of the calculator is the **Total Heat Load**, in BTUs per hour, that is being generated inside the shelter and must be offset in order to maintain a specified range of temperatures inside the shelter. Positive heat load values indicate that an excess of heat is begin generated inside the shelter and that air conditioners are required to remove this excess. Negative heat load values are indicative of a cooling condition where heaters would be required to maintain the required temperature range.

The calculator algorithm breaks down the **Total Heat Load** into four contributing sources:

1. Electrical Equipment:
2. Ventilation/Infiltration
3. Personnel

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4. Structure

Each of these contributing sources is described in detail below.

1. **Electrical Equipment**

All electrical equipment produces some amount of heat during operation. Resistive loads typically convert the majority of electrical energy into thermal energy, while inductive loads such as motors only convert a small portion, converting the majority of electrical energy into mechanical work.

Since the average soldier cannot be expected to be able to specify the level of thermal output of any specific piece of electrical equipment, ***AutoDISE makes the conservative calculation that ALL electrical energy utilized by electrical consumers in an electrical layout is converted into heat.*** Therefore, the heat load due to electrical equipment in a shelter is simply the total power load of all consumers in that shelter, in Watts, converted to BTU/hour.

2. **Ventilation/Infiltration**

Ventilation is the intentional forced addition of outside air into a shelter to promote air circulation. *Infiltration* is the unintentional addition of outside air into a shelter through open windows, open doorways or any cracks and open seams between the outside and inside of a shelter.

Before calculating the heat load due to ventilation and infiltration, the user must know the amount of air, in cubic feet per minute (CFM), ventilated into or infiltrating the shelter from the outside. This value is typically an unknown and cannot be easily calculated by a soldier in the field. In the Army, the minimum ventilation requirement is 10 CFM per shelter occupant of fresh air, while infiltration is sometimes assumed such that the entire volume of the shelter is replaced every hour. ***For AutoDISE, a good estimate of ventilation/infiltration for most shelters is 10 CFM per shelter occupant***.

The heating or cooling load due to ventilation and infiltration is the sum of the sensible and latent heating loads. ***Sensible*** heat is potential energy stored in the air. ***Latent*** heat is the amount of heat released or absorbed by a substance during a change of phase (i.e. solid, liquid, or gas), - also called a phase transition.

The sensible and latent heating or cooling load (Q) due to ventilation and infiltration of air into a shelter is given by:

1. $Q_{sensible}$ = (CFM) * 60 minutes/hour * SW * C_p * (T_a-T_i)
2. Q_{latent} = (CFM) * 60 minutes/hour * SW * H_{vap} * (w_a-w_i)

Where:

SW = specific weight of air = .0762 lb/ft^3

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C_p = specific heat of air = .24 BTU/lb/R
T_a = Outside temperature in °F
T_i = Inside temperature in °F
H_{vap}= enthalpy of vaporization in BTU/lb = -0.5769*(T_a+T_i)/2 + 1093.5 (linear regression)
w_a= outside humidity ratio (lb water/lb air) = .62197 * P_{va} / (P_t-P_{va})
w_i = inside humidity ratio (lb water/lb air) = .62197 * P_{vi} / (P_t-P_{vi})

where

P_{va} = outside vapor pressure in hPA = RH_a * P_{sata} * 100
P_{vi} = inside vapor pressure in hPA = RH_i * P_{sati} * 100
P_t = Total Pressure of the air-water mixture defaulted at ambient pressure = 1013.23 hPA

where

RH_a = Relative humidity outside in %
RH_i = Relative humidity inside in %
P_{sata} = outside saturation vapor pressure in hPA = $6.1078 * 10^{(TaC*A) / (TaC+B)}$
P_{sati} = inside saturation vapor pressure in hPA = $6.1078 * 10^{(TiC*A) / (TiC+B)}$

where

TaC = outside air temperature, in Celsius
TiC = inside air temperature, in Celsius
A=7.5 and B=237.3 for water @ temperature > freezing (0 degrees Celsius)
A=9.5 and B=65.5 for ice @ temperature <= freezing (0 degrees Celsius)

Note: The equations for outside and inside saturation vapor pressures are based on empirical equations derived from air vapor psychometric charts.

3. **Personnel**

Human beings produce heat. The level of heat production by a person is dependent on the level of activity in the shelter. Based on the ASHRAE Fundamentals Handbook, AutoDISE defines five basic levels of activity for persons in a shelter:

1. At Rest: Seated, very little motion or activity, as in viewing a presentation.

2. Light Office Activity: Seated or standing with light walking; using a computer or small office machines

3. Moderate Work: Constant motion, walking; carrying items and moving equipment

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4. Light Bench Work: Using light tools requiring light physical labor

5. Heavy Bench Work: Heavy work requiring significant effort and labor

Each of these activities produces a heat load in BTU per hour per person. This heat load is broken down into sensible and latent heat loads as follows:

Activity	Sensible Heat Load (BTU/hr/ person)	Latent Head Load (BTU/hr/ person)
At Rest	225	105
Light Office Activity	250	200
Moderate Work	275	275
Light Bench Work	275	475
Heavy Bench Work	635	965

The **Total Heat Load** due to personnel in a shelter is simply the sum of the sensible and latent heat loads for each person in the shelter given a specific level of activity for all persons.

4. **Structure**

Heat is transferred in and out of shelter through its walls, floor and roof. The amount of heat transferred is dependent on the structure of the shelter, that is its design and shape, as well as the material of which the shelter is constructed.

Calculation of **Total Head Load** for the shelter structure is broken down into two major categories: the roof and walls, and the floor.

Roof and Walls

Calculation of thermal loads for roof and wall surfaces involves solution of complex heat transfer equations which govern the flow of heat between the environment and structure. The amount of heat transferred is dependent on several factors including the temperature difference between the inside and outside of the surface. The interior desired temperature of the structure is a given parameter. The external temperature and environmental conditions can vary widely with locale but are defined in Army Regulation AR 70-38*, Research, Development, Test and Evaluation of Materiel For Extreme Climatic Conditions*, and are therefore also a given parameter.

With interior and exterior conditions defined, a heat balance equation is developed for each surface of the shelter. Heat flows to and from each surface in four primary modes: solar radiation, thermal radiation, convection and conduction:

1. ***Solar (short wave) radiation***, which is made up of direct solar radiation, diffuse sky radiation and ground reflected solar radiation

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2. ***Thermal (long wave) radiation***, which is made up of radiation to and from the atmosphere and radiation to and from the ground
3. ***Convection***, which is made up of forced convection due to wind velocity and natural convection due to air buoyancy
4. ***Conduction***

The heat balance equation for each surface at steady-state is:

$q_{ci} = q_{swa} + q_{co} + q_{lwa} + q_{lwg}$

where

q_{ci} = natural convection and conduction through material into the shelter per unit area
q_{swa} = solar (short wave) radiation into the shelter per unit area
q_{co} = forced convection into the shelter per unit area
q_{lwa} = thermal (long wave) radiation into the shelter from the atmosphere per unit area
q_{lwg} = thermal (long wave) radiation into the shelter from ground per unit area

Each term is now explained in more detail:

- Natural convection and conduction through material into the shelter

$q_{ci} = U_i * (T_{so}-T_{si})$

where

T_{so} = outside surface temperature in °F
T_{si} = inside surface temperature in °F
U_i = overall conductance to / from surface to conditioned space = $1 / (1/h_i + R)$

where

h_i = natural convection heat transfer coefficient = 1.63 horizontal summer
= 1.60 at 45 degrees summer
= 1.46 vertical
= 1.32 at 45 degrees winter
= 1.08 at horizontal winter

For other angles, a curve fit was derived to linearly interpolate an h_i value.
(values derived from ASHRAE Fundamentals Handbook)

R= resistivity of the material

Using the approach defined in the US Army CECOM Shelter System Assessment Model, the resistivity, R, is derived using the overall conductance of the material (U_o),

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also called the "U-Factor", determined during testing of the material in a lab. This value of U_o can be found in material manuals and is the value requested of the user in the HVAC Requirements Calculator.

The equation for U_o is given by: $U_o = 1 / (1/h_v + 1/h_v + R)$ where h_v is the natural convection heat transfer coefficient for a vertical surface = 1.46 (lab tests are done using vertical surfaces). The material resistivity can then be calculated by manipulating this equation:

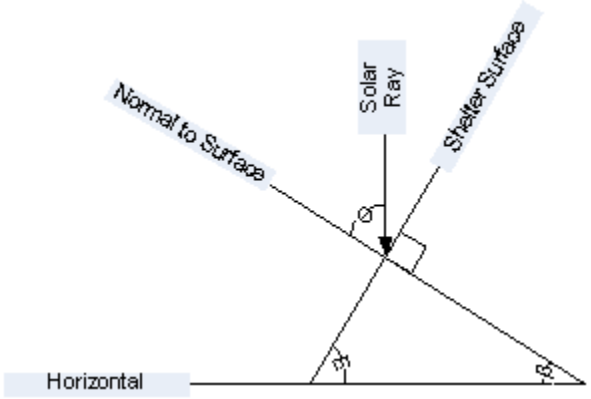
$$R = 1/U_o - 1/h_v - 1/h_v$$

- Solar (short wave) radiation into the shelter

Equation 1: $q_{swa} = P_m * (I_{dn} * \cos(\Theta) + I_{ds} + I_{dg})$

where

P_m= Absorptivity of surface material (called Solar Absorption in AutoDISE)
I_{dn}= Direct normal solar radiation
I_{ds}= Diffuse sky radiation
I_{dg}= Ground reflected radiation
Θ = angle of solar radiation to surface normal vector (see image below)



Equation 2: $I_{dg} = I_{dn} * (C+1) * R_g * [1- \cos(E)]/2$

where

C = diffuse radiation factor
R_g = reflectance of foreground surface
E = angle of surface to horizontal (see image above)

Equation 3: $I_{ds} = I_{dn} * C * [1+ \cos(E)]/2$

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Assuming that the sun is directly overhead (most extreme condition where E=Θ), combining equations 1 through 3 yields:

$$q_{swa} = P_m * I_{dn} * (\cos(E) * [1+C/2-R_g/2-C/2*R_g] + C/2+R_g/2+C/2*R_g)$$

AutoDISE also assumes that:

C = 0.136 for July 21
P_m = .7 for olive drab shelter
$R_g = 1 - S_g$

where S_g= absorbance of foreground surface = .41 grass and earth
= .1 snow
= .2 sand

- Forced convection into the shelter

$$q_{co} = h_c * (T_a - T_{so})$$

where

T_a = Outside temperature in °F
T_{so} = Surface outside temperature in °F
h_c = heat transfer convection coefficient due to wind = $h_{c\_known} * (v_a / v_{a\_known})^{.0675}$

where

v_a = actual wind speed
h_{c_known} = heat transfer convection coefficient due to wind at a known wind speed (book value)
= 3.11 BTU/(h * ft^2 * R) in summer
= 5.11 BTU/(h * ft^2 * R) in winter

v_{a_known} = known wind speed (book value)
= 15 mph in winter
= 7.5 mph in summer

(values derived from ASHRAE Fundamentals Handbook)

- Thermal (long wave) radiation into the shelter from the atmosphere

$$q_{lwa} = G * P_m * P_a * (T_a^4 - T_{so}^4) * (1 + \cos(E)) / 2$$

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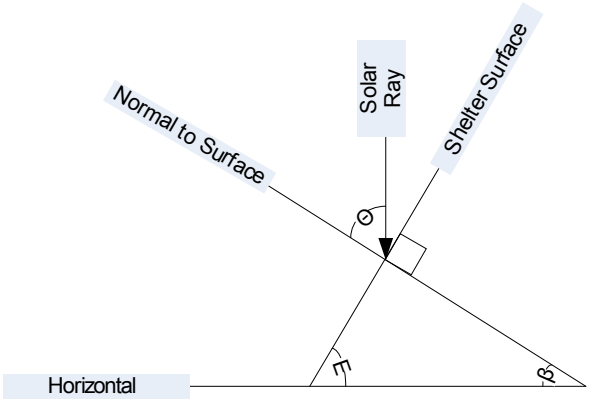
where

G = Stephan-Boltzman Constant = 0.1713 x 10^{-8} BTU / (hr * ft^2 * $°R^4$)
P_m= Absorptivity of surface material (called Solar Absorption in AutoDISE)
P_a = Emissivity of atmosphere = 1 (assumes clear sky)
T_a = Outside temperature in °F
T_{so} = Surface outside temperature in °F
E = angle of shelter surface to the horizontal (see image below)



- Thermal (long wave) radiation into the shelter from the ground

$$q_{lwg} = G * P_m * P_g * (T_g^4 - T_{so}^4) * (1 + \cos(E)) / 2$$

where

G = Stephan-Boltzman Constant = 0.1713 x 10^{-8} BTU / (hr * ft^2 * $°R^4$)
P_m= Absorptivity of surface material (called Solar Absorption in AutoDISE)
P_g = Emissivity of ground = S_g= absorbance of foreground surface = .41 grass and earth
= .1 snow
= .2 sand
T_g = Ground temperature in °F
T_{so} = Surface outside temperature in °F
E = angle of shelter surface to the horizontal (see image above)

With all terms of the heat balance equation at steady state defined:

$$q_{ci} = q_{swa} + q_{co} + q_{lwa} + q_{lwg}$$

we can now solve for the value of q_{ci}. However, solving for q_{ci} requires knowledge of T_{so}, the surface outside temperature. Since this term appears in multiple locations in the heat balance equation, the value must be calculated iteratively using the Newton-Raphson method.

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Once T_{so} is found, the value of q_{ci} may be calculated directly using:

$$q_{ci} = U_i * (T_{so}-T_{si})$$

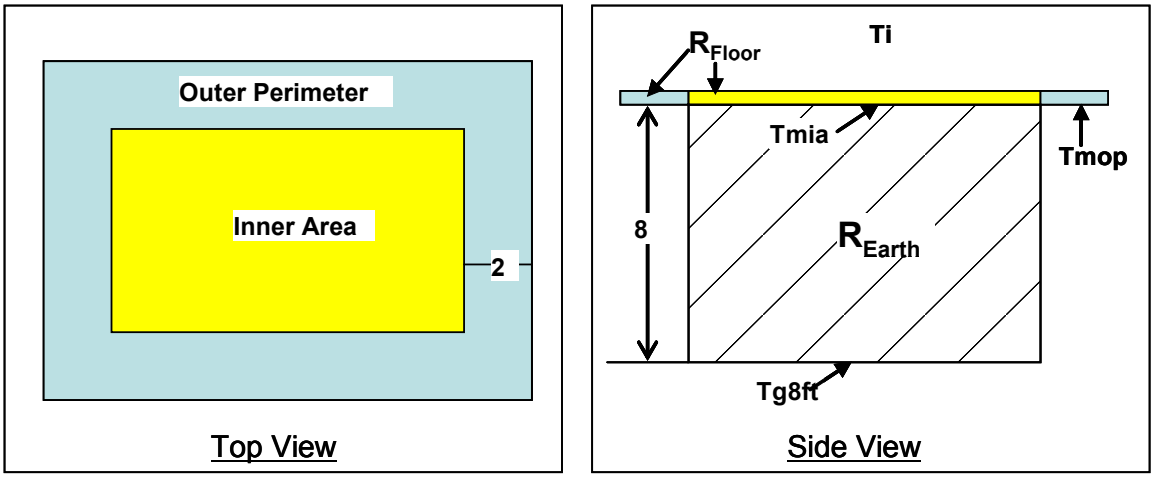
as seen earlier. This represents the heat load, per unit area, for a particular surface on the shelter. Since the heat balance equation uses angles that are unique to each surface, this iterative process must be repeated for each surface comprising the roof and walls.

The final step for calculating the heat load due to the roof and walls of a structure is to multiply the heat load per unit area of a surface as calculated above with the surface area of that surface. The result is a heat load in BTU/hr for each roof and wall, which are then summed to give the total head load due to the roof and walls.

The process for breaking down a shelter into multiple surfaces and determining the dimensions and angles associated with each surface is detailed in Determining Shelter Dimension.

Floor

To approximate the heat load into the shelter from the floor, the floor is broken down into two areas: the outer perimeter and the inner area as shown below:



It is assumed that the temperature of the bottom surface of the outside 2 ft perimeter of the floor (T_{mop}) is at the outside ground temperature. The temperature of the ground 8 ft below ground (T_{g8ft}) is assumed to be at 60 °F.

The total heat load into the shelter from the floor is equal to the heat load from the outer perimeter (q_{op}) plus the heat load from the inner area (q_{ia}).

Outer perimeter

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$q_{op} = U_{op} * (T_{mop} - T_i)$

where

T_{mop} = temperature of outer perimeter of ground = outside ground temperature
T_i = temperature inside the shelter
$U_{op} = 1 / (1/h_{iop} + R_{floor})$

where

h_{iop} = natural convection heat transfer coefficient = 1.63 if $T_{mop} > T_i$
= 1.08 if $T_i >= T_{mop}$

R_{floor} = resistivity of the floor material = calculated from

$$R = 1/U_o - 1/h_v - 1/h_v$$

where U_o is the U-Factor of the shelter material and h_v is the natural convection heat transfer coefficient for a vertical surface = 1.46. See the roof and walls natural convection section for a more detailed explanation of this approach.

Inner area

$q_{ia} = U_{ia} * (T_{g8ft} - T_i)$

where

$T_{g8ft} = 60°F$
$U_{ia} = 1 / (1/h_{iia} + R_{floor} + R_{earth})$

where

h_{iia} = natural convection heat transfer coefficient = 1.63 if $T_i < T_{g8ft}$
= 1.08 if $T_i >= T_{mop}$
$R_{earth} = l_{earth} / k_{earth}$
R_{floor} = resistivity of the floor material = calculated from

$$R = 1/U_o - 1/h_v - 1/h_v$$

where U_o is the U-Factor of the shelter material and h_v is the natural convection heat transfer coefficient for a vertical surface = 1.46. See the roof and walls natural convection section for a more detailed explanation of this approach.

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l_{earth} = 8 ft
k_{earth} = 2.888946 BTU / (ft * °R) for sand
= 13.86694 BTU / (ft * °R) for saturated loom

15.4.1 Determining Shelter Dimensions

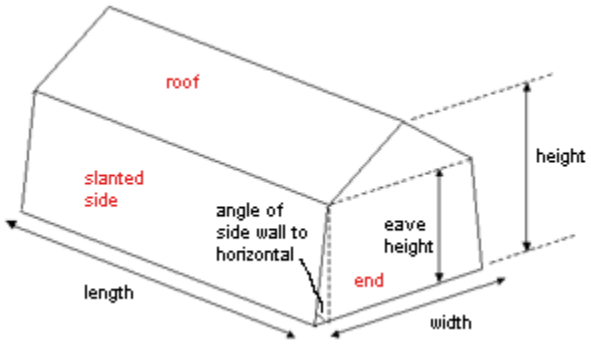
The HVAC Requirements Calculator Algorithm calculations for the heat load through the shelter structure requires that a shelter be broken down into an integral number of surfaces so that the heat load from each surface can be calculated and summed. This section provides the algorithm for breaking down each of the following shelter base shapes:

1. Rectangle
2. Hexagon
3. Octagon
4. Rectangular Dome

For each base shape, we must break down the shelter into a number of surfaces. For each surface, we must know the surface area (A) and the angle of the surface to the horizontal (Θ).

Rectangle

The overall dimensions of a rectangular shelter are shown below:



This type of shelter is broken down into four types of surfaces:

Definitions
EH = eave height
= angle of side wall to horizontal
RH = roof height = height - EH
RW = roof width = width - 2 * EH / tan( )

1. Floor

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$A = length * width$
$\Theta = 0$

2. Roof

$A = 2 * length * (RH^2 + (RW/2)^2)^{1/2}$
$\Theta = \tan^{-1}(RH / (RW/2))$

3. Ends

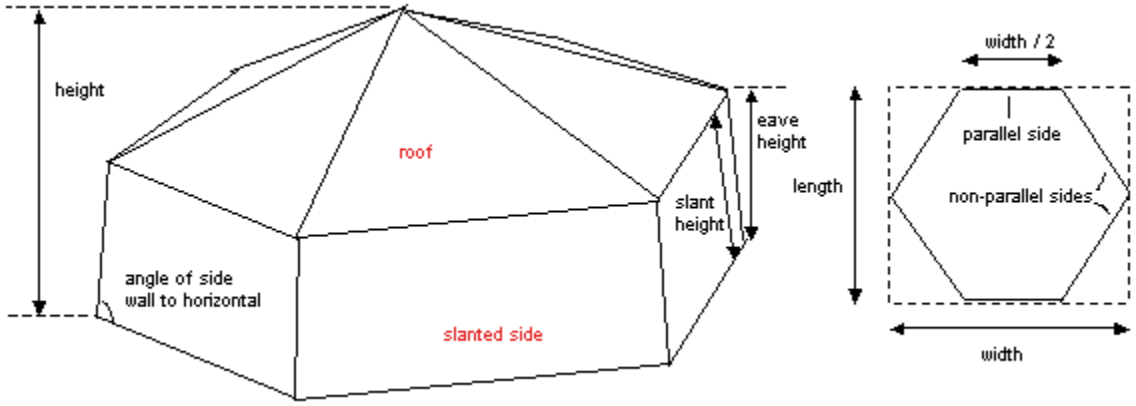
$A = 2 * ((RW * RH)/2 + (width * EH) - (EH * (EH / \tan(\quad))))$
$\Theta = 90°$

4. Slanted Sides

$A = 2 * length * (EH / \sin(\quad))$
$\Theta =$

Hexagon

The overall dimensions of a hexagonal shelter are shown below:



In the current version of AutoDISE, only the length and width of the base floor layout of a shelter is saved. A hexagonal floor layout, however, requires additional information, such as the relative lengths of the six different sides To get this additional information, AutoDISE assumes that the sides of the hexagon which are parallel to the rectangular bounding box are on the width of the shelter and are one half of the width in length.

With this assumption in hand, the three basic surfaces of the hexagon can be calculated:

Definitions
EH = eave height
= angle of side wall to horizontal

1. Floor

$A = length * width - (width/4) * length$
$\Theta = 0$

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2. Roof

Given:

roof length = length - 2 * EH / tan( )
roof width = width - 2 * EH / tan( )
roof height = height - EH

A = approximated as a dome using a formula derived by Knud Thomsen:

$$\approx 2\pi\left(\frac{a^p b^p + a^p c^p + b^p c^p}{3}\right)^{1/p}$$

where

a = roof length / 2
b = roof width / 2
c = roof height / 2
p = 1.6075, a number that yields a percent error of only about 1.06

The roof angle is approximated by:

$\Theta = \tan^{-1}$(roof height / roof width / 2)

3. Slanted sides

The sides NOT parallel to the bounding box may have lengths different from the length calculated for the sides parallel (width / 2):

$$\text{length}_{\text{nonparallel}} = ((\text{width} / 4)^2 + (\text{length} / 2)^2)^{1/2}$$

The length of the roof is shorter than the length of the side due to the angle of side wall to horizontal. Therefore, for any side length $\text{length}_{\text{side}}$:

$$\text{length}_{\text{sideroof}} = \text{length}_{\text{side}} - 2 * (\text{EH} / \tan( ))$$

The height along the slant (see image) is slightly longer than the eave height due to :

$$\text{height}_{\text{slant}} = \text{EH} / \sin( )$$

The area of each side is the area of the trapezoid defined by the bottom and top lengths and the height along the slant:

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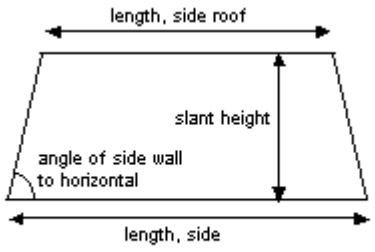
$$A_{side} = length_{side} * height_{slant} -((length_{side} - length_{sideroof}) /2) * height_{slant}$$



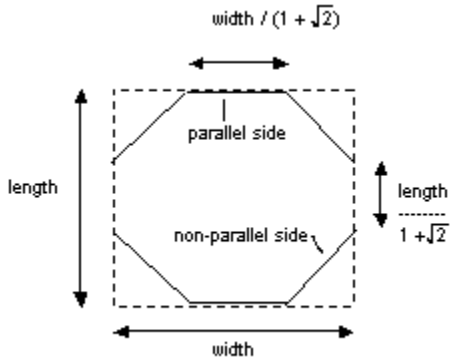
Typical Side Trapezoid

The total area of the slanted sides is the sum of all six trapezoids:

$A = 2 * A_{parallel} + 4 * A_{nonparallel}$
$\Theta =$

Octagon

The octogonal shelter is broken down in a manner almost identical to the hexagonal shelter, except that we have eight sides to manage and a different floor layout:



Once again, assumptions must be made to derive the octogonal side lengths from the bounding rectangle. For the octagon, we assume that the length of a side parallel to the bounding rectangle is equal to the length of that bounding rectangle side divided by $(1 + 2^{1/2})$. See the image above.

With this assumption in hand, the three basic surfaces of the octagon can be calculated:

Definitions
EH = eave height
= angle of side wall to horizontal

1. Floor

$A = length * width - 2 * ((length - length / (1 + 2^{1/2})) /2) * ((width - width / (1 + 2^{1/2})) /2)$

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$\Theta = 0$

2. Roof

Given:

roof length = length - 2 * EH / tan( )
roof width = width - 2 * EH / tan( )
roof height = height - EH

A = approximated as a dome using a formula derived by Knud Thomsen:

$$\approx 2\pi \left(\frac{a^p b^p + a^p c^p + b^p c^p}{3} \right)^{1/p}$$

where

a = roof length / 2
b = roof width / 2
c = roof height / 2
p = 1.6075, a number that yields a percent error of only about 1.06

The roof angle is approximated by:

$\Theta = \tan^{-1}$(roof height / roof width / 2)

3. Slanted sides

The sides NOT parallel to the bounding box may have lengths different from the length calculated for the sides parallel:

$$\text{length}_{\text{nonparallel}} = (((\text{length} - \text{length} / (1 + 2^{1/2})) /2)^2 + ((\text{width} - \text{width} / (1 + 2^{1/2})) /2)^2)^{1/2}$$

The length of the roof is shorter than the length of the side due to the angle of side wall to horizontal. Therefore, for any side length l_{side}:

$$\text{length}_{\text{sideroof}} = \text{length}_{\text{side}} - 2 * (\text{EH} / \tan( ))$$

The height along the slant is slightly longer than the eave height due to :

$$\text{height}_{\text{slant}} = \text{EH} / \sin( )$$

The area of each side is the area of the trapezoid defined by the bottom and top lengths and the height along the slant:

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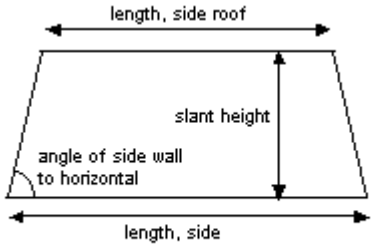
$$A_{side} = length_{side} * height_{slant} -((length_{side} - length_{sideroof}) /2) * height_{slant}$$



Typical Side Trapezoid

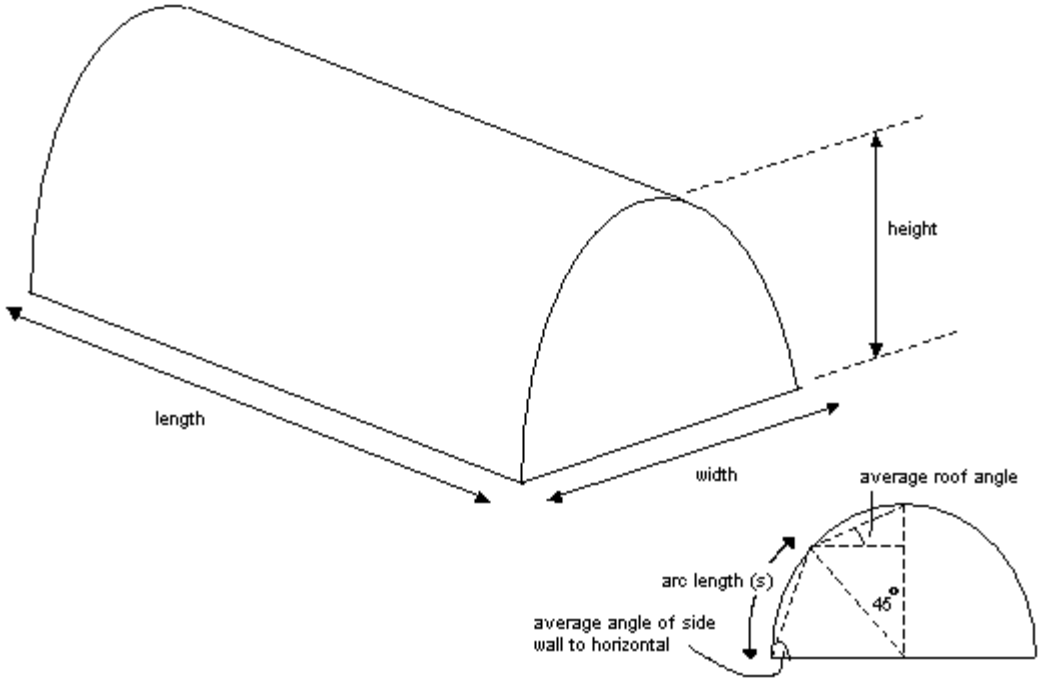
The total area of the slanted sides is the sum of all eight trapezoids:

$$A = 2 * A_{width} + 2 * A_{length} + 4 * A_{nonparallel}$$

Θ =

Rectangular Dome

The overall dimensions of a rectangular dome shelter are shown below:



The rectangular dome shelter is broken down into four basic surfaces: floor, ends, roof and sides. Since the roof and sides are really one contiguous surface, we must break down the surface into two parts and find average angles for each part. This is done by bisecting the 90 degree angle between the floor and the vertical and finding the average angle of side wall to

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horizontal and average roof angle as shown in the image above:

average angle of side wall to horizontal = 67.5°
average roof angle = 22.5°

In addition, the arc length, s, is required, which can be found using:

$$s = \prod / 4 * ((height^2 + (width / 2)^2) / 2)^{1/2}$$

The surface areas may now be calculated:

1. Floor
   A = length * width
   $\Theta = 0$

2. Roof
   A = 2 * s * length
   $\Theta = 22.5°$

3. Ends
   A = $\prod$ * height * (width / 2)
   $\Theta = 90°$

4. Slanted sides
   A = 2 * s * length
   $\Theta = 67.5°$

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